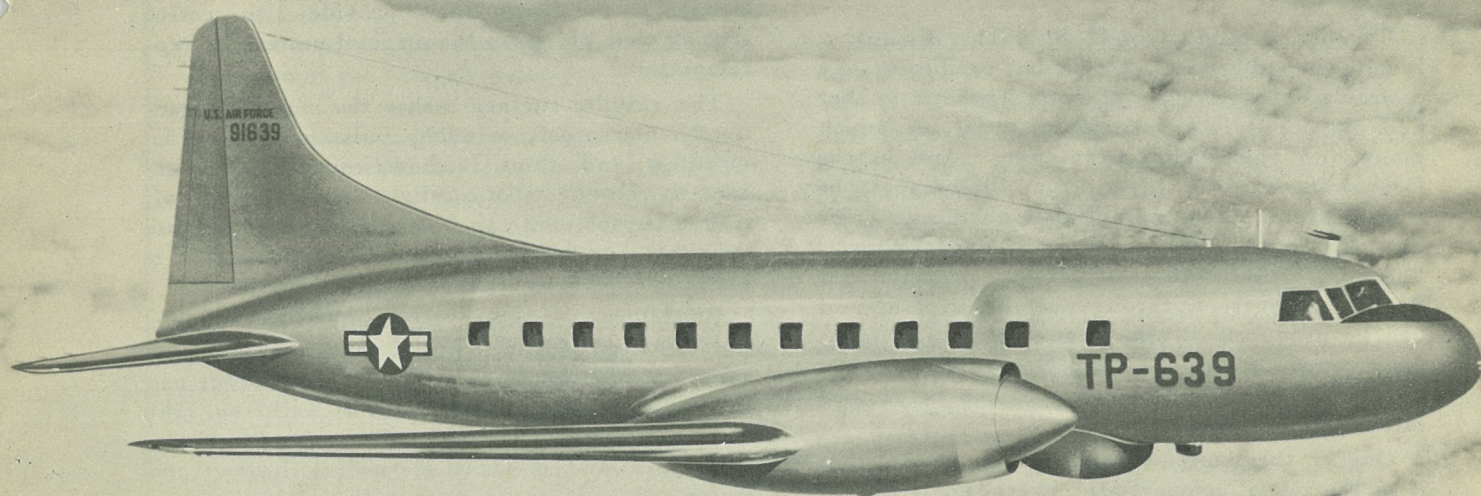


Convair

TRAVELER



DECEMBER 1, 1951

CONSOLIDATED VULTEE

AIRCRAFT CORPORATION

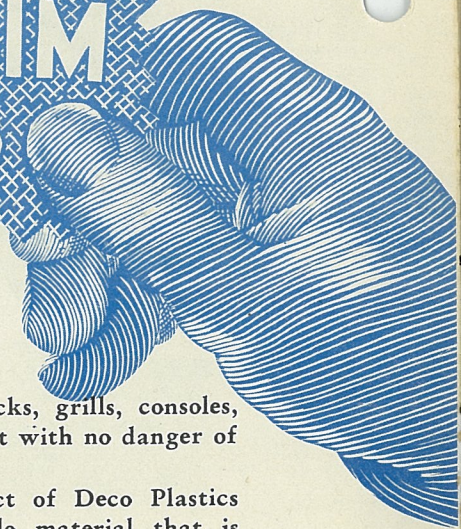
SAN DIEGO, CALIFORNIA

VOLUME III

Number 8

340

INTERIOR TRIM MATERIALS



Convair has made a careful study of interior lining and trim materials for the Convair-Liner 340. With the many new decorative plastic materials now on the market, making a selection was not an easy task. The materials decided upon were chosen with an eye to beauty, durability, ease of handling, and resistance to stains and soil. Important too, was to find products that were lightweight as well. The materials selected embody all of these desirable features and result in an appreciable weight saving over those used in comparable applications in the Convair-Liner 240.

The following paragraphs describe briefly the products selected for the various uses in the Model 340.

Royalite, a product of U. S. Rubber Company, is neither a rubber nor a plastic but combines many desirable characteristics of both synthetic rubber and plastic. It is a versatile material for which many and varied uses have been found in the Convair-Liner 340. It will not stain, spot, or streak, even in salt water. It is outstanding for its toughness, being highly resistant to impact, abrasion, and fracture. It is used in rigid and flexible applications throughout the airplane and can be produced in almost any color. The finish can be smooth, grained, or patterned. It is easily punched, drilled, and sawed, and can be formed into intricate shapes.

One of the most outstanding uses of Royalite is in the pilots' compartment overhead. It is pre-formed so that it fits the fuselage contour. By removing a few screws, the formed sections can be lowered or completely removed for easy access to the electrical wiring in the overhead.

Another application in the 340 is in the waist-scotting in the passenger compartment. In this application, sufficiently flexible Royalite panels are used to permit ready installation. Because it is easily formed, it is used in such applications as

window frames, magazine racks, grills, consoles, etc. Screws can be drawn tight with no danger of fracture.

Kalistron, a plastic product of Deco Plastics Inc., is a transparent flexible material that is formed of a special vinylite plastic with the desired color fused to the underside by a special process that produces richness and depth. The color is then protected by a suede-like backing.

Another variation in the use of transparent Kalistron lies in fusing to the underside actual wood veneers, patterns, designs, photo or art murals, and the like, with suede-back flocking, thus making one complete fabric. Not only does it add richness to the design but it provides a protective coating that preserves the original pattern or representation.

The vinylite surface makes the material practically mar-proof, assuring resistance to scuffs, scratches, and stains. It shows exceptional resistance to the effects of sunlight. It is waterproof, stain-resistant, and can be easily cleaned. Because it is soft and pliable and easy to fabricate, it is used for upholstering crew members' seats.

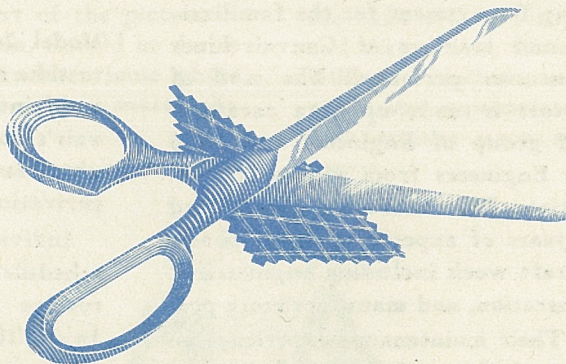
Goodallite, a product of Goodall Fabrics, Inc., is a textured plastic material that is available in a variety of colors and designs. This product can be used in the same applications as Kalistron. Like Kalistron it is resistant to fading, abrasive wear, and spots, and is easily cleaned with soap and water.

Vinyon, a product of Flightex Fabrics, Inc., is used in the headlining. It is a synthetic material spun from a solution of copolymerized vinyl chloride and crylo-nitrile, with color added by a light coating process. It has elastic memory so that it returns to its original tension after severe deformation, yet is dimensionally stable in that it does not shrink or stretch with changing moisture conditions. It is non-absorbent, making stains, grease,

and grime easy to remove. It is unaffected by extreme low or high temperatures, and has good acoustical characteristics.

Another overhead lining that is available is Dynel, also a product of Flightex Fabrics, Inc. It has the appearance and feel of fine wool but is superior in that the low moisture pick-up of the fibers makes it difficult to stain or spot. It is virtually unaffected by such strong chemicals as hydrochloric acid, sulphuric acid, and sodium hydroxide. It is immune to mildew, moths, and fungi.

Floor coverings, in addition to fine grade carpeting in the passenger compartment, consists of Durug (a product of Duracote Corp.) and Rug Top Avtrim (made by B. F. Goodrich). Both materials are wear and scuff resistant. They are unaffected by moisture, oils, greases, and most acids and alkalis, and are easy to clean. Dirt is not ground in and "spotting" is unnecessary since the material is highly non-absorbent. The effective styling of these materials simulate grains that, at first glance, can be mistaken for actual wool carpeting.



ON THE COVER

Pictured on the cover is an artist's conception of the Convair-Liner 340 with turboprops.

The successful flight-testing of the 44-passenger Convair-Liner 340 plus the fine performance of the Convair Turboliner have interested the Air Forces in the possible advantages that could be obtained from a combination of these two airplanes. As a result, a number of Convair's 44-passenger 340 commercial transports with turboprops have been ordered by the Air Forces for test purposes.

Three configurations will be built: a basic airplane without special equipment, a bombardier trainer, and a third type that will contain the latest electronic equipment and instruments.

Initially they will be powered with 3000-horsepower Allison T-38 gas turbine engines. Structural provisions will be made for easy installation of advanced Allison turboprop engines with higher horsepower ratings as soon as they become available.

Pressurization will provide training conditions that will simulate actual military missions in modern high-altitude bombers.

First delivery of the new planes will be accomplished in a relatively short time since the design was developed from the T-29 and Convair-Liner 340, both of which are in current production at Convair.

Convair-Liner 340s may be converted to use turboprops when they become available for commercial use.

The *Convair* TRAVELER

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Consolidated Vultee Aircraft Corporation
San Diego, California

December 1, 1951

A digest of Convair-Liner operation and service published monthly by Convair in the interest of Convair-Liner operators and for the promotion of sales and service. Communications should be addressed to Chief of Service, Convair, San Diego 12, California.

F. W. Fink, *Chief Engineer*

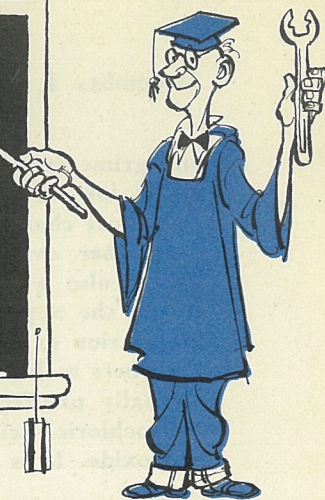
J. J. Alkazin, *Chief of Service*

G. S. Hunter, *Editor*

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MAINTENANCE TRAINING PROGRAM

CONVAIR 340 LINER



A maintenance training course has been set up by Convair's Service Engineering Department for the familiarization and training of Convair-Liner 340 customer personnel. The staff of instructors is made up of a carefully selected group of Engineers and Field Service Engineers from within the organization. The instructors have had many years of experience in all phases of aircraft work including engineering, field operation, and manufacturing processes. Their maintenance experience on the Convair-Liner 240 and their close contact with the design and fabrication of the Convair-Liner 340 mock-up and prototype befits them for this assignment.

A wide range of subjects is offered, and schedules are flexible enough to meet the needs of airline personnel who require either general or specialized training.

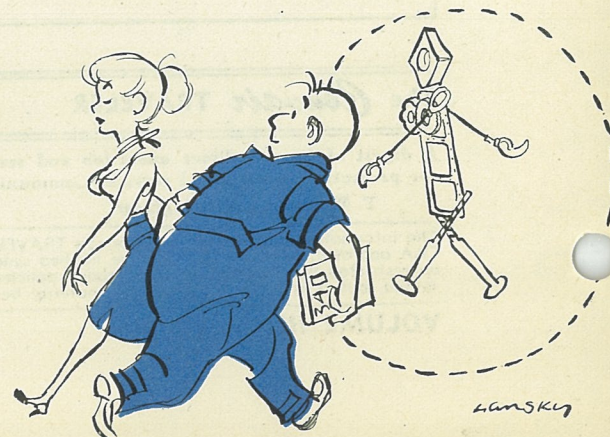
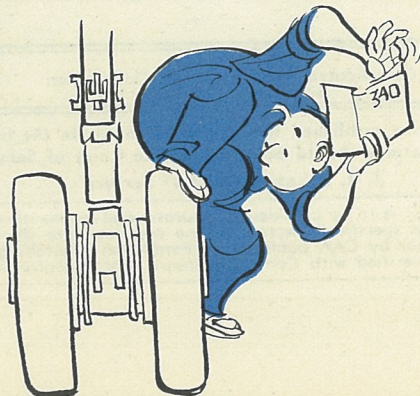
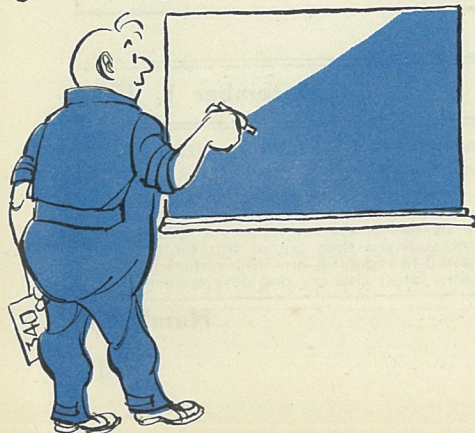
The schedule is so arranged that the operator may send trainees in one or more phases of maintenance. Since some 340 customers are already operating Convair 240s, their maintenance personnel may require instruction only on those systems that differ from the 240. Operators can schedule their personnel for one or more required classes, as desired. Convair-Liner 340 customers operating flight equipment other than

Model 240s will want their personnel to take advantage of the full course to acquaint them with, for example, Convair's configuration of the R-2800 engine, reversible propellers, and pressurization.

Individual operators' trainees are scheduled so that they will be able to receive training in individual classes. In addition, this will permit the instructors to devote the entire course to the one model airplane. Where it is necessary for maintenance trainees from different organizations to attend classes together, every effort will be made by the instructors to insure that adequate applicable information is offered.

Several hours of each subject lecture will be devoted to conducted tours of flight and assembly lines. On these tours the trainee will not only become familiar with the airplane as a whole, but will be able to observe manufacturing and fabrication details as well. The entire course will run four forty-hour weeks and will cover seven major subjects.

Patterns of instruction are formulated for the practical man who requires an immediate understanding of the features of the airplane he is to service.



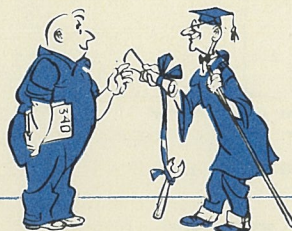
To assist the instructors and also help the trainee to understand quickly and easily the mechanisms and diagrams, considerable emphasis is placed on visual training aids. One of these training aids is the Visual-Cast projector, a method whereby schematics or flow diagrams are projected on a large screen in a normally-lighted room. The instructor can outline a system function merely by placing a transparent sheet over the visual aid slide and tracing the system with a grease pencil or a ball point pen. With this device, the instructor can hold the groups' attention since he faces the group and no part of the picture is obstructed during the projection. Should he desire their undivided attention to further some phase of the subject, he removes the subject matter by covering the transparency.

Slides of all the important systems in the Con-

vair-Liner 340 will be available. In addition to providing more effective methods of illustrating system functions, the slides eliminate the need for cumbersome wall charts.

Another form of visual training will utilize dynamic and animated mock-ups. Several operable cutaway components will also be used to show system and component function.

Classes will run from 8:00 AM to 5:00 PM, Monday through Friday, and the first class is tentatively scheduled to start January 7, 1952. Model 340 Maintenance Manuals will be used as the basic text. To supplement class room lectures and discussions, those taking part in the courses will use a Maintenance Manual and an instructors' guide. An appropriate certificate will be issued to each trainee upon successful completion of the course.



Fuselage Loft Lines and Dimensions

CONVAIR-LINER
340

The illustrations and chart on pages 90 and 91 show the basic water lines, beltframe stations, and buttock lines of the Convair-Liner 340. The sketch immediately below the beltframe stations diagram of figure 1 shows the basic water lines, plus the constant section, or that portion of the fuselage between stations 182.5 and 679 that is uniform in dimension. (The shaded area is contoured for which W.L. and B.L. offsets are provided in the chart.) The radius of the constant section is 56.5. The center line of this radius is shown on the chart. The same radius center line holds for all stations aft of 679, since that portion of the fuselage is also symmetrical. The radii from stations 9 to 182.5 vary on the lower surface. These radii are given in the accompanying chart.

The illustration at the right-hand side of the chart shows the exact point of intersection of water lines and buttock lines with relation to the stringer and skin. The point of intersection is that point inside the fuselage skin where the buttock line, the heel of the horizontal stringer, and the water line intersect.

The graph in the upper right-hand corner of figure 1 locates four beltframe stations and gives the contours at these points, this information being supplied in the chart.

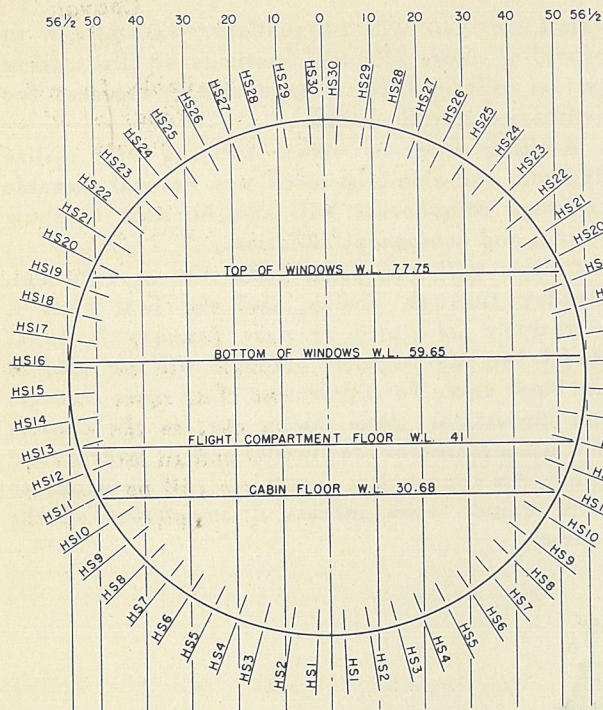
To use the chart for plotting the contour of station 9, for example, proceed as follows:

1. Locate B.L. 0 and W.L. 65.55.
2. Locate B.L. 10 and W.L. 63.42.
3. Locate B.L. 14.56 and W.L. 60.
4. Locate B.L. 16.97 and W.L. 56.5.
5. Radius for station 9 is 18.94, which is to be located at W.L. 47.46.
6. Using this radius, draw an arc from the center line to the first connecting point, which is the mark made at B.L. 16.97 and W.L. 56.5.
7. Connect remaining location points by drawing a line through them.

Note

The sketch in the upper left-hand corner shows Water Lines and Buttock Lines as well as Horizontal Stringer locations.

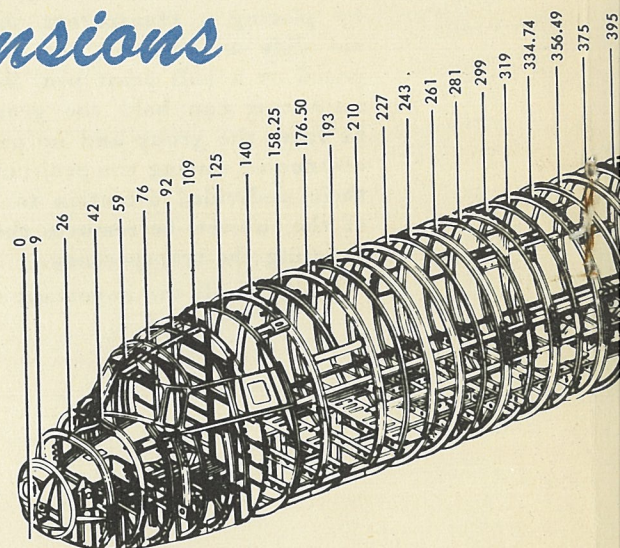
Fuselage Loft Lines and Dimensions



Base line of fuselage is taken at Water Line 0. Planes of all Water Lines are parallel to horizontal base line.

Vertical $\mathcal{L}$ of fuselage is 0 Buttock Line. Planes of all Buttock Lines are parallel to vertical $\mathcal{L}$ plane.

Horizontal Stringers are approx. parallel to longitudinal axis of semi-monocoque fuselage. Stringers are numbered as indicated.

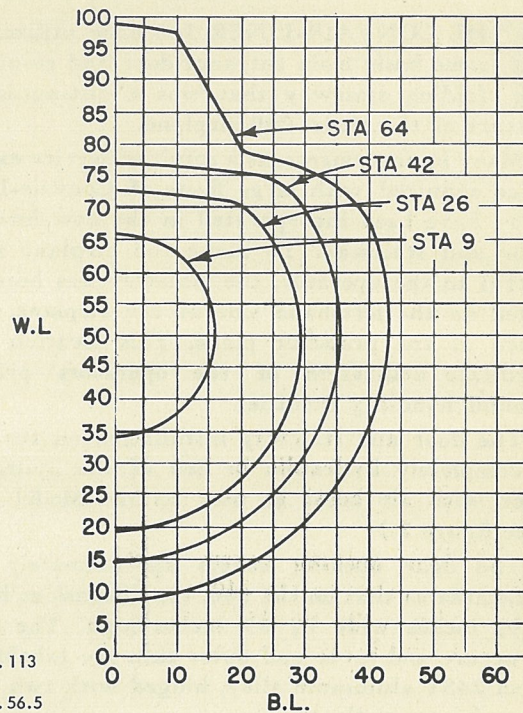
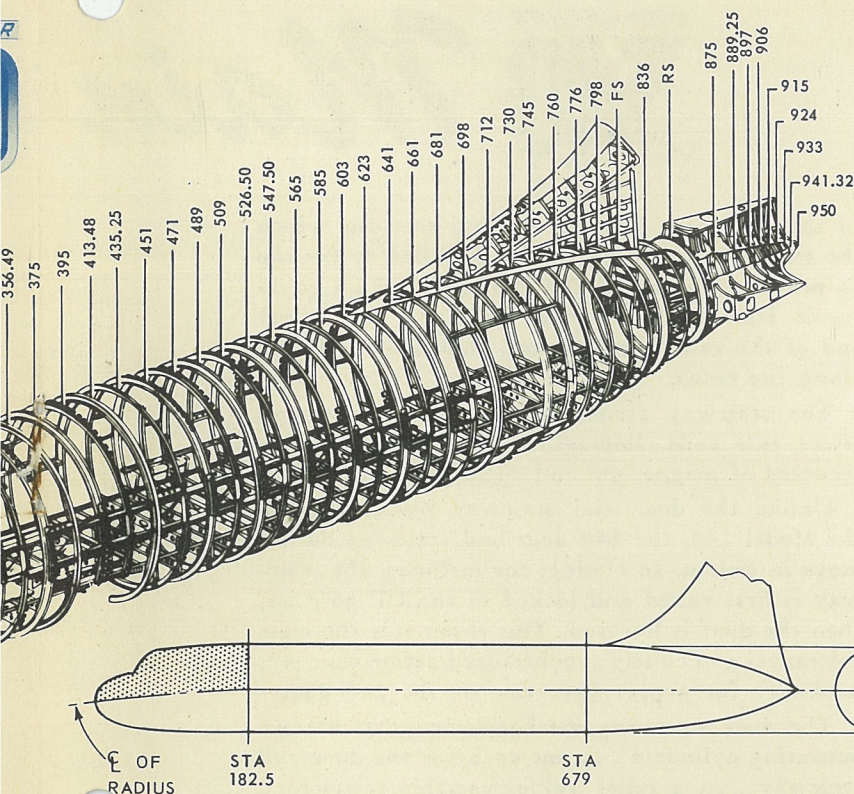


WATER LINE AND BUTTOCK LINE

Station (in inches)	9	26	42	59	64	78	92	109	125
	WATER LINE								
B.L. 0	65.55	74.31	77.86	80.03	98.70	104.31	107.38	109.75	111.2
B.L. 10	63.42	73.76	77.52	79.68	94.75	103.06	106.25	108.69	110.2
					(Windshield)				
B.L. 20		71.16	76.09	78.34	78.94	99.75	103.28	105.84	107.4
B.L. 30			71.66	75.08	75.80	93.82	97.92	101.01	102.5
B.L. 40				65.75	67.87			89.75	93.7
B.L. 50					44.09	46.86	49.84	52.27	54.0
	BUTTOCK LINE								
W.L. 70		22.21	31.85	36.38					74.7
W.L. 60	14.56	29.40	36.81	41.44	38.28	41.09	44.69	48.50	51.7
W.L. 56.5	16.97	30.16	37.34	42.04	43.48	46.22	49.27	51.89	53.7

RADI FOR DETERMINING WATER LINE AND BUTTOCK LINE

Station (in inches)	9	26	42	59	76	92	109	125	158.25	176.5
(Note: Radii shown are lower surface only from station 9 to station 182.5)										
Radii	18.94	30.67	37.65	42.99	47.035	49.96	52.31	54.035	56.08	56.0
W.L. Height of Radius $\mathcal{L}$	47.76	49.10	50.50	51.88	53.08	54.05	54.87	55.48	56.305	56.0
Station				681	698	712	730	745	760	776
Radius				56.49	56.14	55.43	54.00	52.40	50.47	48.0
W.L. Height of Radius $\mathcal{L}$				56.5						



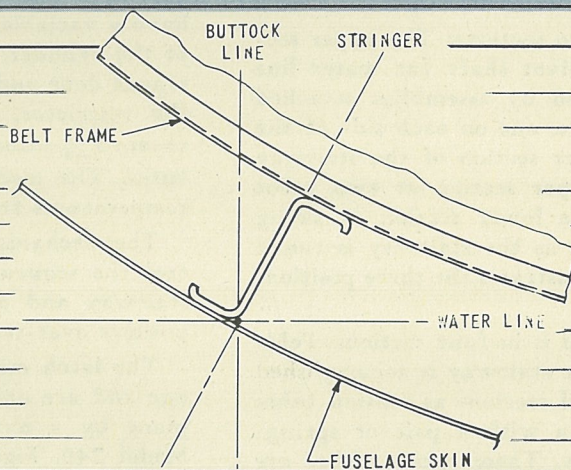
All contours are to the inside of fuselage skin.

LINE OFFSETS FOR SHADED AREA

125	140	158.25	176.5
111.22	112.12	112.74	112.965
110.24	111.215	111.845	112.075
107.435	108.38	109.025	109.315
102.55	103.30	103.975	104.35
93.78	94.975	95.875	96.36
54.02	80.065	82.12	82.73

DOCK LINES

74.74	53.51	54.455	54.83
57.72	55.05	55.93	56.35
53.79	55.19	56.075	56.46



BUTTOCK LINE OFFSETS (EXCEPT SHADED AREA)

176.5	182.5	Constant Section		679							
56.46	56.5	Constant Section		56.5							
56.48	56.5	Constant Section		56.5							
776	798	836	875	889.25	897	906	915	924	933	941.32	950
48.00	44.12	35.95	25.89	21.84	19.55	16.83	14.03	11.15	8.22	5.45	—
Constant Water Line Center Point											56.5

THE CONVAIR-LINER 340 door utilizes the same basic main entrance door and co-acting folding stairway that was a distinguishing feature of the Model 240 airplane.

Many improvements, as a result of service experience acquired with large fleets of Convair-Liner 240s, have been incorporated in the new integral door and stairway. To make the airplane more useful to the operator, the stairway has been located on the left-hand side of the airplane, forward of the propeller plane. This location will facilitate utilization of the operators' present ground handling facilities.

The door and stairway installation on the 340 is completely hydraulic in lieu of the hydraulic door with air boost as used on the Model 240. (See figure 2.)

The door opening covers approximately the same area as that on the 240, the dimensions being $36\frac{1}{2}$ inches wide by 83 inches high. The door structure and inner and outer skin are fabricated from 24ST aluminum alloy, hinged with two steel piano hinges at the top.

The door is pressure-sealed by a new type self-energizing synthetic rubber seal that is easily installed. Aluminum alloy extrusions riveted around the periphery of the door are the retainers for the seal. Simplicity of installation of the new seal is illustrated in the October 1, 1951 issue of the TRAVELER.

The stairway is in two sections: The upper section is mounted on a pivot shaft (at water line 10.64) that is supported by assemblies attached to the fuselage structure, one on each side of the entrance way. The lower section of the stairway is connected to the upper section at two pivot points. This permits the lower section to swing downward (jack-knife) as the stairway is raised or lowered. (Figure 3 illustrates the three positions of the stairway.)

The stairway handrail is in four sections. Folding and unfolding of the stairway is accomplished by utilizing the handrail sections as tension tubes operating in conjunction with a pair of spring-loaded telescoping tubes. These spring tubes are connected at the center pivot assembly of the railing. The pivot is mounted on the upper end of the large fairing that is attached to the upper section of the stairway. The spring tube assembly passes over the stair-folding pivot when the stair moves from the folded to the unfolded position. In so doing, the spring tube furnishes a positive moment, tending to hold the stairs folded when UP, or unfolded when DOWN.

At the top, the handrail connects through a series of pivoting rod, arm, and support assemblies



to the stairway. Micarta rollers, between which the stair rail track moves, are installed at the top to prevent binding of the stair rail, which could result from an inadvertent pull near the upper end of the rail. The stair rail rollers move freely along the track.

The stairway structure, including the steps, risers, side rails, fairings, and handrails, is constructed of magnesium and 24ST aluminum alloy.

Unlike the door and stairway installation on the Model 240, the 340 door and stairway do not move in unison. In closing, for instance, the stairway is first raised and locked in the UP position; then the door is lowered. This eliminates the close tolerances and closely synchronized action that was necessary for proper operation of the 240 door.

The door actuating mechanism consists of two actuating cylinders . . . one each for the door and stairway . . . a relief valve, variable restrictors, sequence valves, latching mechanisms, and the connecting tubing and linkage. The relief valve protects the system from gusts or manual override. The door and stairway actuating cylinders each have a variable restrictor that is an integral part of the cylinder. The speed of operation of the entrance door and stairs may be adjusted by setting the restrictor, which is set at the factory to obtain $5\pm\frac{2}{0}$ -second operation at normal temperatures. The mechanism is designed to operate at temperatures from -40°F to $+140^{\circ}\text{F}$.

The mechanically-operated sequence valves control the sequence of operation for the door and stairway and are designed into the linkage for positive over-travel before sequencing.

The latch mechanisms are located in the fuselage and are operated from the inside of the airplane by a handle similar to that used on the Model 240. Figure 4 illustrates the typical hook latch, secondary pin and lock-plate, and the inter-lock.

The main entrance door and stairway are operated by hydraulic power derived from the landing gear DOWN line or by the auxiliary hydraulic pump. When the main system is in operation, the door receives pressure from the landing gear DOWN line to prevent operation in the air and to keep pressure off the door during flight.

A selector valve, located on the stairway compartment wall, controls door and stairway actu-

Entrance Door

ation. The door (canopy) is mechanically and automatically locked when in the OPEN position and the stairway is similarly locked when in the retracted position. The door, when closed, is locked in position by mechanical latches manually operated by wall handles. The stairway, when extended, is not locked but simply rests on the ground, stabilized by its own weight.

When the control handle is moved to the OPEN position, the selector valve is positioned to allow fluid to enter the EXTEND side of the door actuating cylinder, opening the entrance door. Movement of the door to the UP and LOCKED position in turn serves to actuate the door sequence valve, permitting fluid to pass on down to the stair uplatch cylinder, where it serves to unlatch the stair.

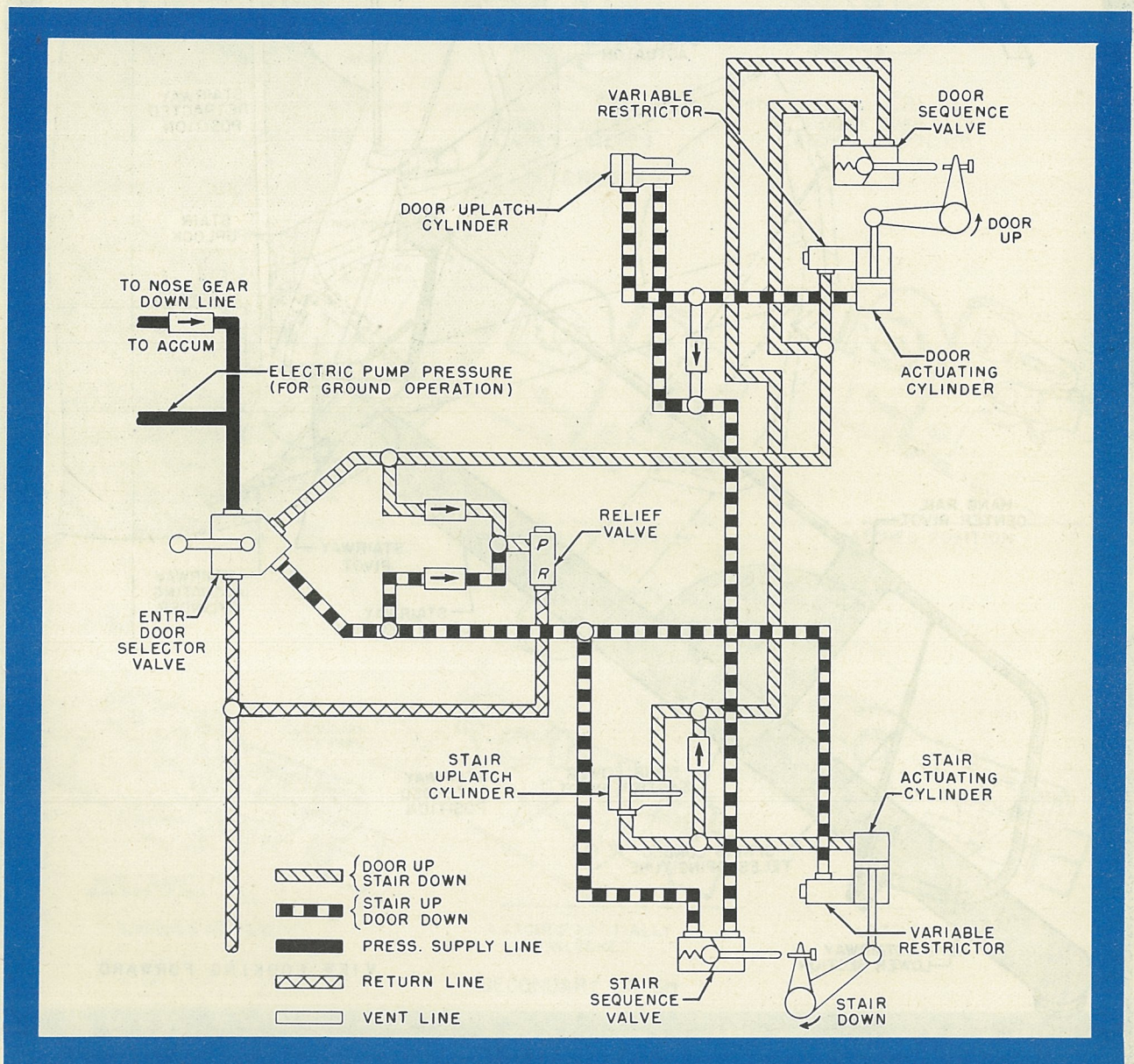


Figure 2. Hydraulic System Schematic of Main Entrance Door.

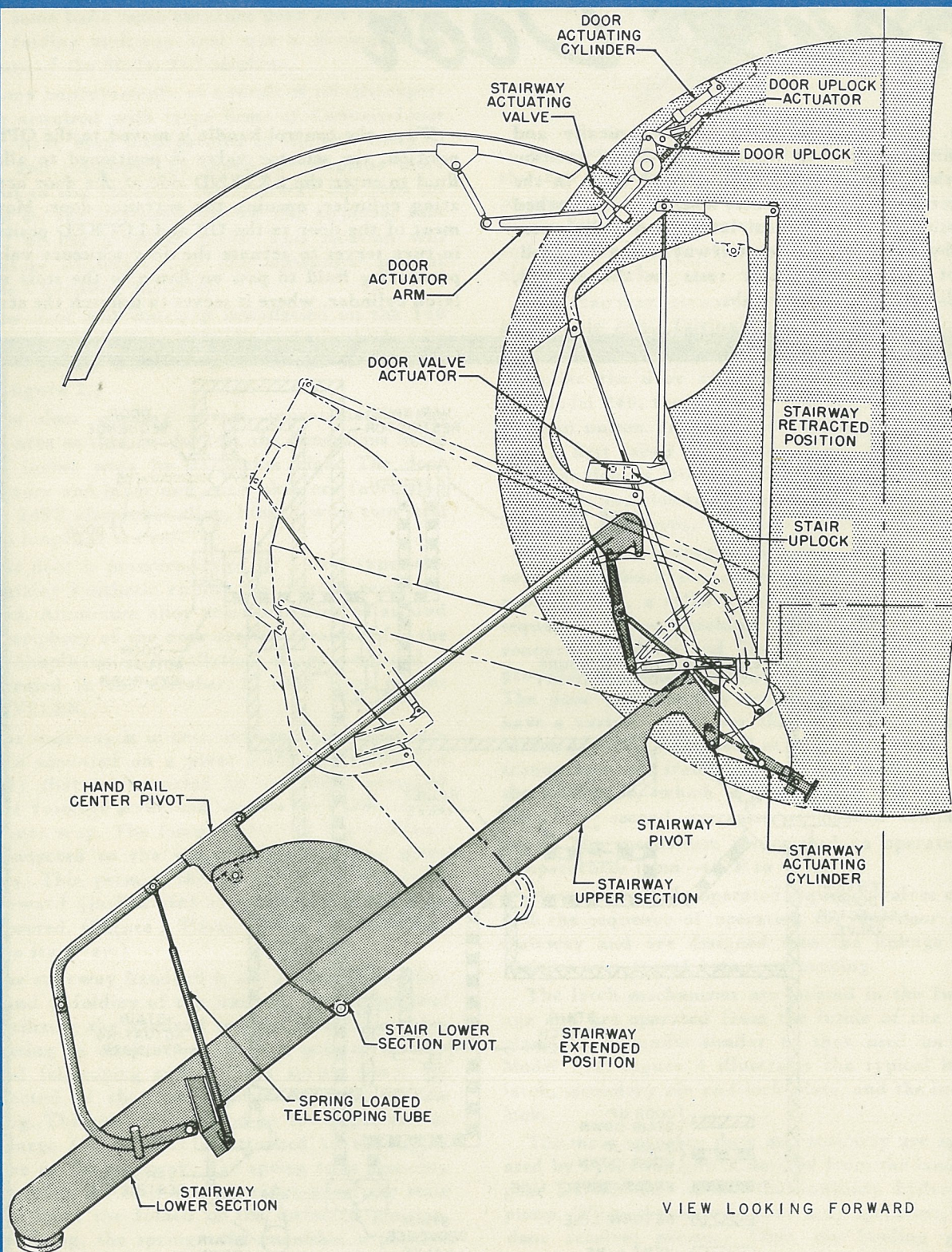


Figure 3. Stairway Operating Positions.

Fluid then flows into the EXTEND side of the stair actuating cylinder, acting upon the piston and extending the stairway.

When the control handle of the selector valve is moved to the CLOSE position, the valve is positioned to allow fluid to enter the RETRACT side of the stair actuating cylinder, thus retracting the

stair. Movement of the stair to the UP and LOCKED position in turn serves to actuate the stair sequence valve, permitting fluid to flow to the door unlatch cylinder where it serves to unlatch the door. Fluid then passes to the RETRACT side of the door actuating cylinder, acting on the piston and closing the entrance door. When the

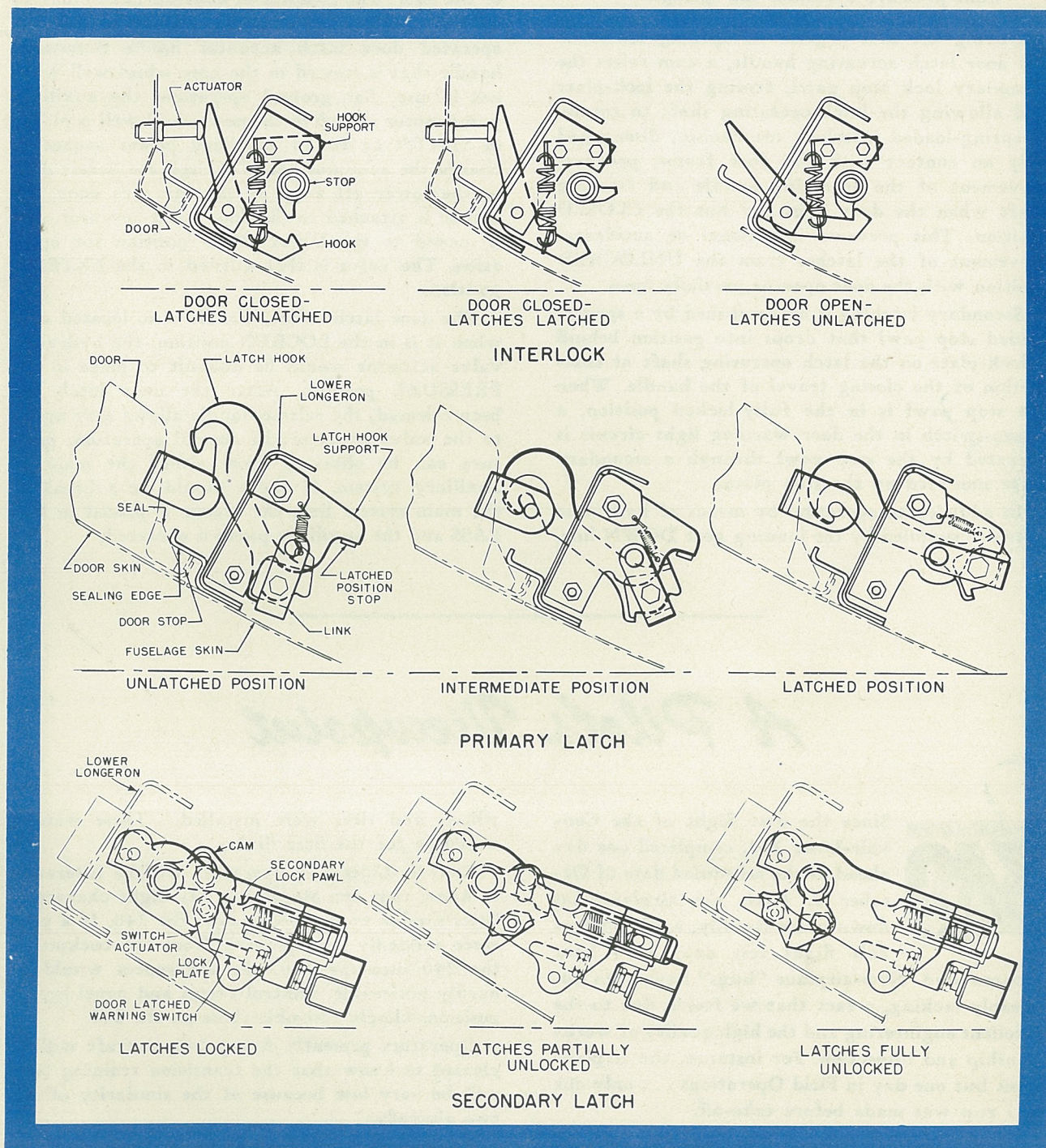


Figure 4. Main Entrance Door Latch Mechanisms.

door is closed, it is locked in place by mechanical latches that are manually operated.

Note

Uplatching is mechanical in that the door and stairway override the spring-loaded latches. Unlatching is hydraulic since fluid pressure overrides the springs.

During the first degrees of opening travel of the door latch actuating handle, a cam raises the secondary lock stop pawl, freeing the lock-plate and allowing the latch-operating shaft to rotate. A spring-loaded interlock mechanism, disengaged only on contact with the door frame, prevents movement of the operating handle and latching shaft when the door is in any but the CLOSED position. This prevents intentional or accidental movement of the latches from the UNLOCKED position with the door open or partially open.

Secondary latching is accomplished by a spring-loaded stop pawl that drops into position behind a lock-plate on the latch operating shaft at completion of the closing travel of the handle. When the stop pawl is in the fully-locked position, a micro-switch in the door warning light circuit is operated by the stop pawl through a secondary lever mounted on the stop plate.

In addition to operation by means of hydraulic pressure supplied by the landing gear DOWN line,

the door and stairway may be operated from outside the airplane by use of the electric hydraulic motor, for which a control switch is located outside the airplane in the nose wheel well. The electric pump switch is hot at all times. Controls for ground operation are located under an inspection type door at station 183, just aft of the lower edge of the door. The two sets of controls are connected by bell cranks and tubular linkage. The ground-operated door latch actuator has a removable handle that is stowed in the nose wheel well when not in use. For ground operation, the auxiliary pump motor switch in the nose wheel well is placed in "BAT," or to an auxiliary power source to charge the accumulator. Through the access door at the lower aft edge of the entrance door, the handle is attached to the door latch actuator, and is moved to the UNLOCKED position for operation. The valve is then turned to the EXTEND position.

The door latch release handle is so located that when it is in the LOCKED position, the hydraulic valve actuator would be difficult to place in the PRESSURE position. After the door latch has been released, the release handle allows easy access to the valve actuator. In normal operation, pressure can be obtained from either the main or auxiliary system. If there should be a break in the main system line, the system is placed in BY-PASS and the auxiliary pump is operated.

A Pilot's Viewpoint



Since the first flight of the Convair-Liner 340, completed one day ahead of the scheduled date of October 6, 1951, the airplane has flown quite steadily, and considerable flight test data have been accumulated. New-airplane "bugs" have been noticeably lacking, a fact that we feel is due to the excellent engineering and the high quality of workmanship and inspection. For instance, the airplane spent but one day in Field Operations . . . only one taxi run was made before take-off.

Very little maintenance was required between flights. The only delay of any consequence was when the new main landing gear struts and larger

wheels and tires were installed. These weren't available for the first flights.

Convair-Liner 240 operators will be interested to know that the Model 340 has flight characteristics similar to its predecessor, the 240. If a pilot were suddenly transplanted from the cockpit of the 240 into the 340, the differences would be hardly noticeable. Control forces and panel layout positions closely resemble those on the 240.

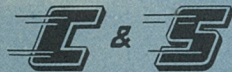
Operators presently flying 240 aircraft will be pleased to know that the transition training time will be very low because of the similarity of the two aircraft.

In general, the Model 340 has retained all of the excellent flight and handling characteristics of the 240 with many added refinements.



Convair

TRAVELER



May 1952
Anniversary Issue

CONSOLIDATED VULTEE

VOLUME IV

AIRCRAFT CORPORATION

SAN DIEGO, CALIFORNIA

NUMBER 1



Convair... SAN DIEGO

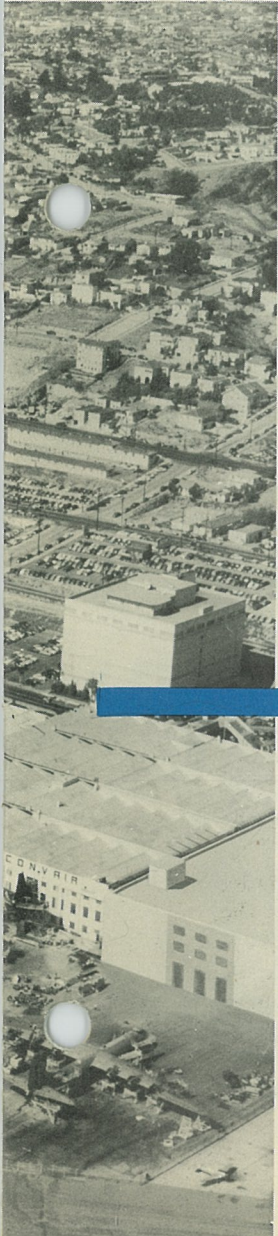
FLIGHTS from the North and East terminate at San Diego, the Southwestern-most part of the United States . . . bordered on the South by Mexico, Baja (Lower) California, and on the West by the Pacific Ocean.

Within a stone's throw of the air terminal is Convair's San Diego Division. The plant adjoins Lindbergh Field's main 8,600-foot heavy-duty

runway and supplemental landing and taxi strips. Weather bureau reports show Lindbergh Field to be open 97.3 per cent of the time, making it an ideal location for conducting flight tests.

In addition, the dry sub-tropical climate permits carrying on many of the line maintenance and airplane overhaul operations outside . . . operations that would normally be carried on inside a hangar.





CONVAIR

The entrance to Convair's San Diego Division where the world's leading twin-engine airliner is being built for the world's leading airlines.

Insignia of present Convair-Liner operators and purchasers are shown on the cover.

The *Convair* TRAVELER

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May 1952

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VOLUME IV

Number 1

Evolution and Development

SHORTLY after World War II, airline operators throughout the world were much in need of modern two-engine aircraft and, with such guiding factors as recommendations by domestic and overseas airlines and their pilots, and other interested groups, Convair's first volume-produced commercial transport, the Convair-Liner 240 was conceived.

The Convair-Liner 340 design is a recital of an astonishing number of "firsts," which were developed and incorporated into the Model 240. Continuing to strengthen its position as a leader in the manufacture of twin-engine aircraft, Convair has incorporated these "firsts," with additional refinements and improvements, in the new transport. In making these changes and improvements, Convair did not lose sight of the operators' spare parts stocking problems. They planned many of the assemblies for interchangeability, not only for interchangeability with the 240, but with aircraft of other manufacturers as well.

Some of the distinctive features incorporated in Convair-Liners are: the self-contained door and stairway installation, orange peel cowlings, reverse propellers, cabin pressurization, low drag cooling

provided by augmentors, a cockpit designed by pilots, and many other features. A description of these and other features follows, with a brief discussion on the improvements and changes that have been made in the Model 340.

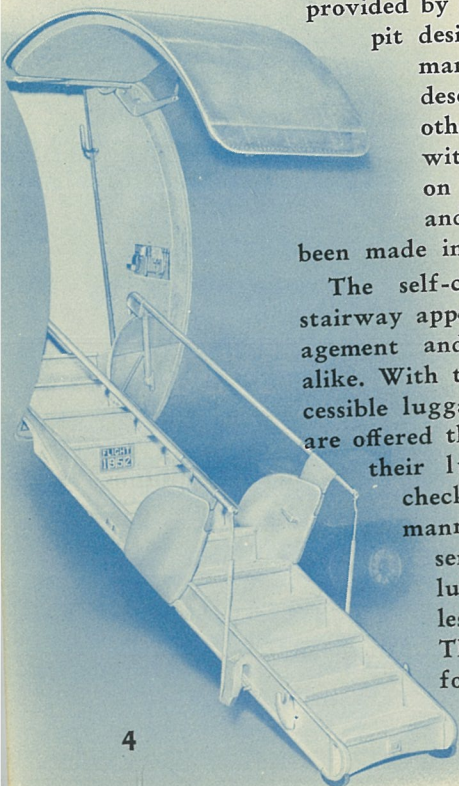
The self-contained door and stairway appealed to airline management and the flying public alike. With this stairway and accessible luggage racks, passengers are offered the choice of carrying their luggage aboard or checking it in the usual manner. These same passengers can pick up their luggage and deplane in less than three minutes. There is no need to wait for a portable ramp to

be wheeled up, nor do they have to wait in the terminal for their luggage to be brought to them. This high degree of efficiency is particularly time-saving at intermediate points where a number of terminating passengers deplane and new passengers board. The smoothness and speed of the operation is a pleasant experience for passengers. Convair-Liner 340 operators have found it a "must" for new aircraft.

Many improvements resulting from service experience acquired with large fleets of Convair-Liner 240s have been incorporated in the new integral door and stairway. To make the airplane more useful to the operator, the stairway has been located on the left-hand side of the airplane, forward of the propeller plane. This location will facilitate utilization of the operators' present ground-handling facilities. The door and stairway installation on the 340 is completely hydraulic in lieu of the hydraulic door with air boost as used on the Model 240 airplane.

The Convair 240 was one of the first twin-engine transports to use Pratt & Whitney's war-proved Double-Wasp R-2800 series engines. A unique installation of Convair design makes use of jet exhaust thrust augmentation to provide low drag cooling. The exhaust gases from the engine are ejected from specially designed exhaust pipes and enter the augmentors at a speed of around 1700 mph. The velocity of the gases creates a low pressure which sucks outside cooling air into the nacelle.

Although CB16/17 engines (used on the Model 340) have horsepower ratings comparable to the CA15 and CA18 engines (used on the Model 240), higher cruising powers are allowed and take-off power can be held to much higher altitudes, where these powers really count. The increase in fuel consumption with the higher rated engines is negligible. CB16 power ratings are based upon use of



of the Convair-Liner 340

100/130 grade fuel. In the event that grade 108/135 fuel is used, the engines can be operated to CB17 ratings (T.O. power, wet, 2500 BHP; T.O. power, dry, 2200 BHP).

Incorporated in the CB16/17 engines is a single-stage, two-speed supercharger. Shifting from one speed to another is electrically-controlled by a switch on the pilots' pedestal.

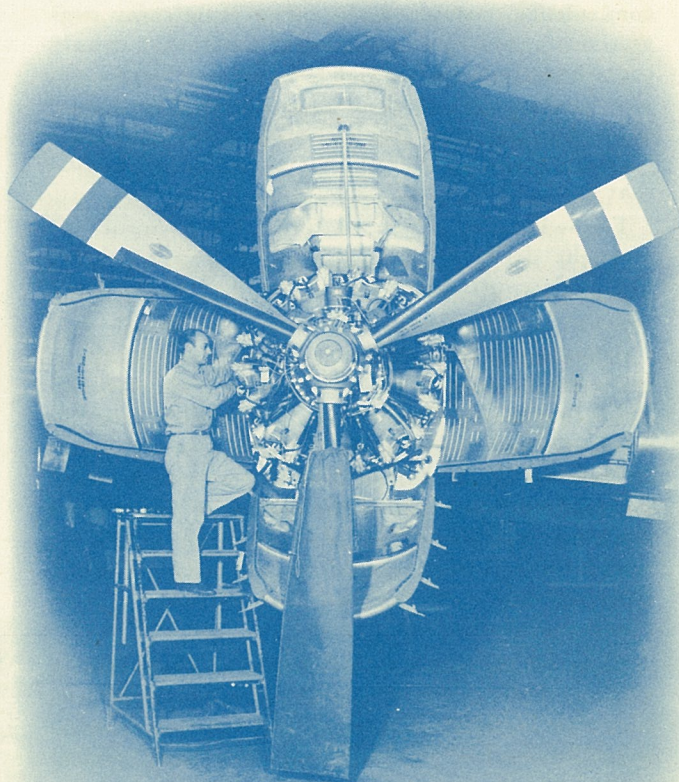
Being service-tested and studied is a CB16/17 engine installation in a Convair-Liner 240. Convair-Liner operators have shown a marked interest in this installation because they would like to modify their Convairs primarily to effect engine standardization and to obtain improved performance and service life. This installation is especially of interest to those Convair-Liner operators who will operate both Models 240 and 340 airplanes.

Siamese exhaust stack assemblies used on the Model 340 are expected to lower exhaust port back pressures and cylinder head temperatures with resultant increase in service life and engine reliability. The stacks will result in better cooling of the exhaust stack ends because of increased spacing provided by a new clamp arrangement. The stacks are available with or without ceramic coating.

Orange peel cowling, after serving a successful "apprenticeship" on the Convair-Liner 240, was adopted for the Model 340. Maintenance personnel acclaim it the greatest time-saver and maintenance aid ever devised for any aircraft. Because it provides quick accessibility to the power plant installation it is being adapted to many military aircraft.

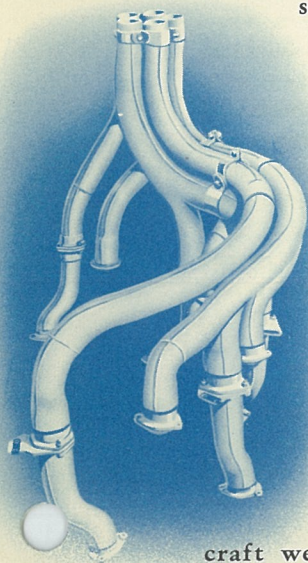
This cowling, being fully cantilevered with the nacelle, does not vibrate with the engine; consequently, its wear and maintenance are minimized. The panels are attached to the nacelle, even during engine change, thus minimizing handling damage. Snubbers secure the panels in the open position. In flight, trunklatch fasteners with secondary camlocs secure the panels in the closed position.

Cowl flaps as installed on other aircraft were not considered necessary on the 240 since augmentors provide more efficient cooling



than that obtained from conventional cowl flaps. The addition of two small residual heat doors in the top cowl panel provide the necessary heat control, and give the nacelles exceptionally clean aerodynamic lines. On the Model 340, two additional nacelle flaps are added in the lower cowl panel to facilitate engine cooling below specified operating limits, if desired.

Hamilton Standard three-bladed, dural, 13' 5" propellers provide for selective constant-speed operation, full feathering, and reversing. The reversible pitch feature provides a powerful braking force during landings, and makes possible reverse taxiing. On icy or wet runways, they help to stop the airplane safely. Inadvertent propeller reversing is prevented by an electro-mechanical locking system that is not actuated until the airplane is on the ground. Since Convair 240 operators did not find secondary throttle locks necessary, Convair feels that they are not justified for installation on the Model 340, and they have been eliminated.



The 13' 5" propellers are a standard type that are interchangeable with those on other aircraft. This same propeller can be cut off for use on Model 240 airplanes, thus simplifying the stocking program for operators.

Convair engineers, in seeking to build a flight deck that would establish an entirely new conception of flying efficiency and pilot comfort and convenience, consulted the airline pilots for suggestions, recommendations, and ideas that would contribute to the design of the perfect flight deck. Their suggestions were precise, detailed, and close to their hearts. The result . . . the first flight deck planned by pilots for pilots . . . and an airplane that is easier and more comfortable to fly.

Following are a few of the items incorporated in flight decks of Convair-Liners as a result of Convair's continued recognition of problems and desires of flight and maintenance crews.

The pilots' seats, designed for fatigue-free comfort, are adjustable forward and aft and up and down. Controls, throttles, and switches are located for maximum convenience.

The same wide-angle pilot vision that was designed into the flight deck of the Model 240 is designed into the Convair 340. Windshield wipers have been lowered to give a greater area of unobstructed vision.

Improved thermal protection against icing and clouding is provided by an electrically-heated transparent conductive vinyl layer buried in the construction of the heavy safety glass. Multiple tap transformers are installed so that the pilots can select the desired voltages to be applied to the glass. Temperature sensing elements of the wire grid type, embedded in the vinyl layer of the glass assembly, operate to maintain the glass at a minimum temperature of 28.3°C (83°F). At approximately 35°C (95°F), the power to

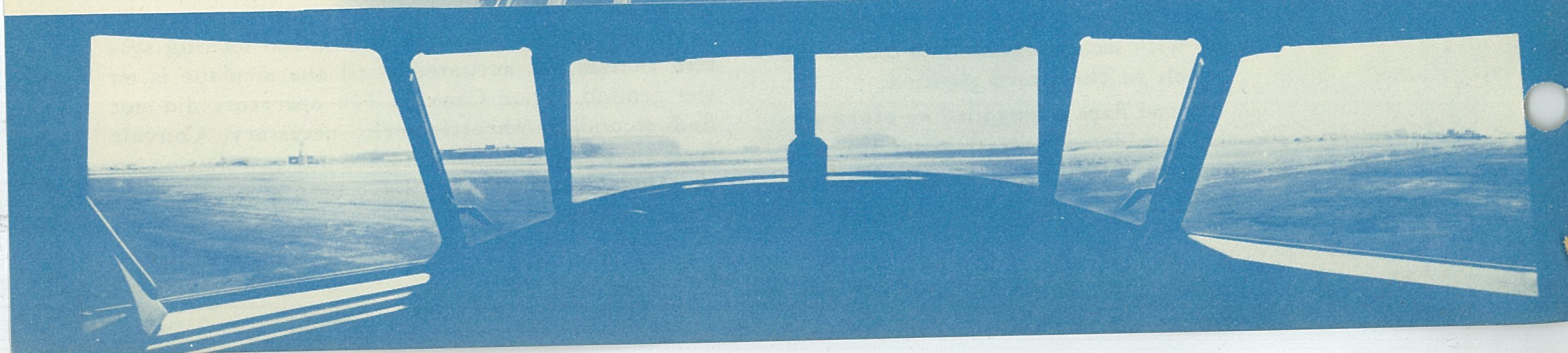
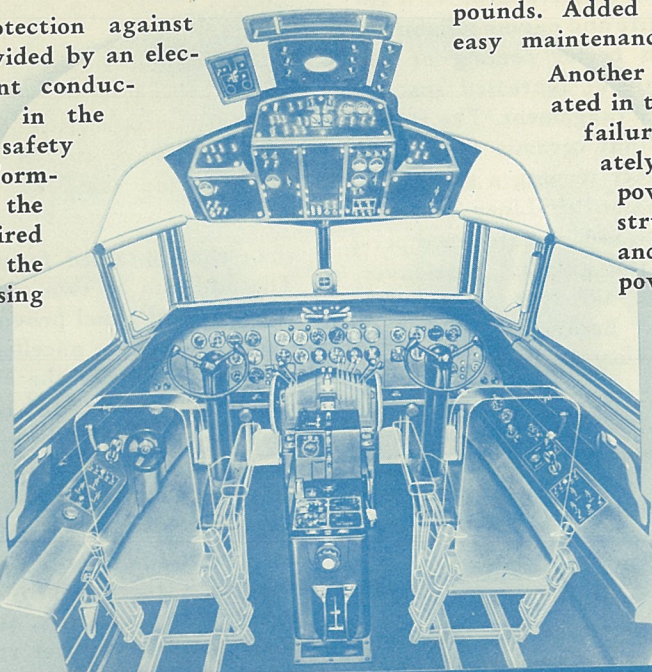
the glass is automatically turned off to prevent damage from overheating. The system thus cycles between these temperature limits.

In event of failure of either inverter, the windshield anti-ice selector switch may be turned to select Position No. 4 or No. 5 (depending upon which inverter has failed), and power will then be supplied from the remaining inverter for anti-icing of the pilot's main windshield panel.

From a maintenance standpoint, installation of the windshield on the Model 340 is greatly improved. The outboard mounting facilitates replacement. Mounting screws installed with spacers prevent overtightening, a condition that could contribute to vinyl flow.

Extra safety is provided by special devices. These, at the proper time, warn the pilot of necessary operations, prevent inadvertent use of controls, and give warning of, or actually rectify, a dangerous condition. Among these warning devices are the fire detector warning and control systems. The installation on the 340 was designed as a result of service experience and improved design. One of these is the double-loop fire detecting system; the other is a new fire extinguishing agent, Chloro-Bromomethane, or "CBM," which gives twice the protection of CO₂ (used on the Model 240) with a weight saving of 150 pounds. Added to these advantages are easy maintenance and serviceability.

Another safety feature incorporated in the Model 340 is the power failure indicator which immediately indicates even a partial power failure of the flight instruments for both the pilot and copilot. Under normal power conditions, a cup-shaped drum, half of which is black and the other half fluorescent, will show only the black half. If a power failure occurs, the fluorescent half becomes visible. The degree to which it becomes visible depends



upon the degree of failure. If one phase of the applied voltage fails, or if the voltage on all three falls below 18 volts, the fluorescent half of the drum becomes entirely visible.

Red and white, rheostat-controlled lighting and red filtered lights are incorporated. The overhead switch panel is lighted by red and white spot lights installed aft of the pilots' positions. When navigation lights are turned on, the majority of indicating lights are automatically dimmed to assure proper light intensity under fading outside light conditions.

The Sperry A-12 automatic pilot and installation has undergone many improvements in design since it was first installed in the Convair-Liner 240. Better location of servo controls facilitates maintenance, and erection time is 20 seconds as compared to two minutes on the Model 240. Autopilot a-c equipment is designed to operate on either inverter; however, when NESA glass is in use, the autopilot inverter is automatically cut into the circuit to provide a uniform source of power for operation of the autopilot. This changeover is provided in order to offset the uneven load factor put on the normal inverter system by the cycling of the NESA glass.

The hydraulic system is centralized at the hydraulic equipment panel located at the aft end of the nose wheel well. The panel is accessible with the nose wheel well fairing open. Hydraulic pressure is supplied to the panel where it is controlled and distributed to the various subsystems. An electric-driven auxiliary hydraulic pump is installed for operation of hydraulic equipment on the ground or in flight. Ground operation of the entire system is possible also through the use of a portable test stand.

MIL-O-5606 fluid is used generally in the main hydraulic arrangement; however, some operators are using the system modified for Skydrol, a phosphate ester base fire-resistant hydraulic fluid.

System components operate at a normal pressure of 2700 to 3000 psi supplied by two engine-driven fixed-displacement pumps. The system is a semi-open-center arrangement which includes a manually-operated bypass valve that relieves pressure in the entire system (with the exception of the brake and accumulator) when the valve is in "bypass."

Electrical wiring and electrical equipment are separated from hydraulic tubing and installations to facilitate maintenance of electrical and hydraulic systems.

The basic electrical system is a conventional ground return system that operates on 24 to 28 volts direct current. D-C power is supplied to the

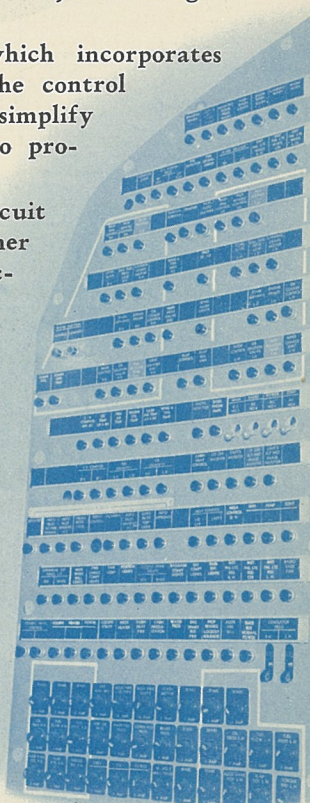
system by two 375-ampere generators connected in parallel and by one 24-volt, or two 12-volt batteries, connected in series, and by an outside power source through a polarized external power receptacle. A switch, located on the overhead switch panel, transfers power from external power to the airplane battery without interruption. Actuation of an emergency switch supplies power direct from the batteries for the following installations: compass light, check-off list, left and right generator reset, fire detector, fire extinguishing, flare release, instrument panel white lights, and fuel control valves.

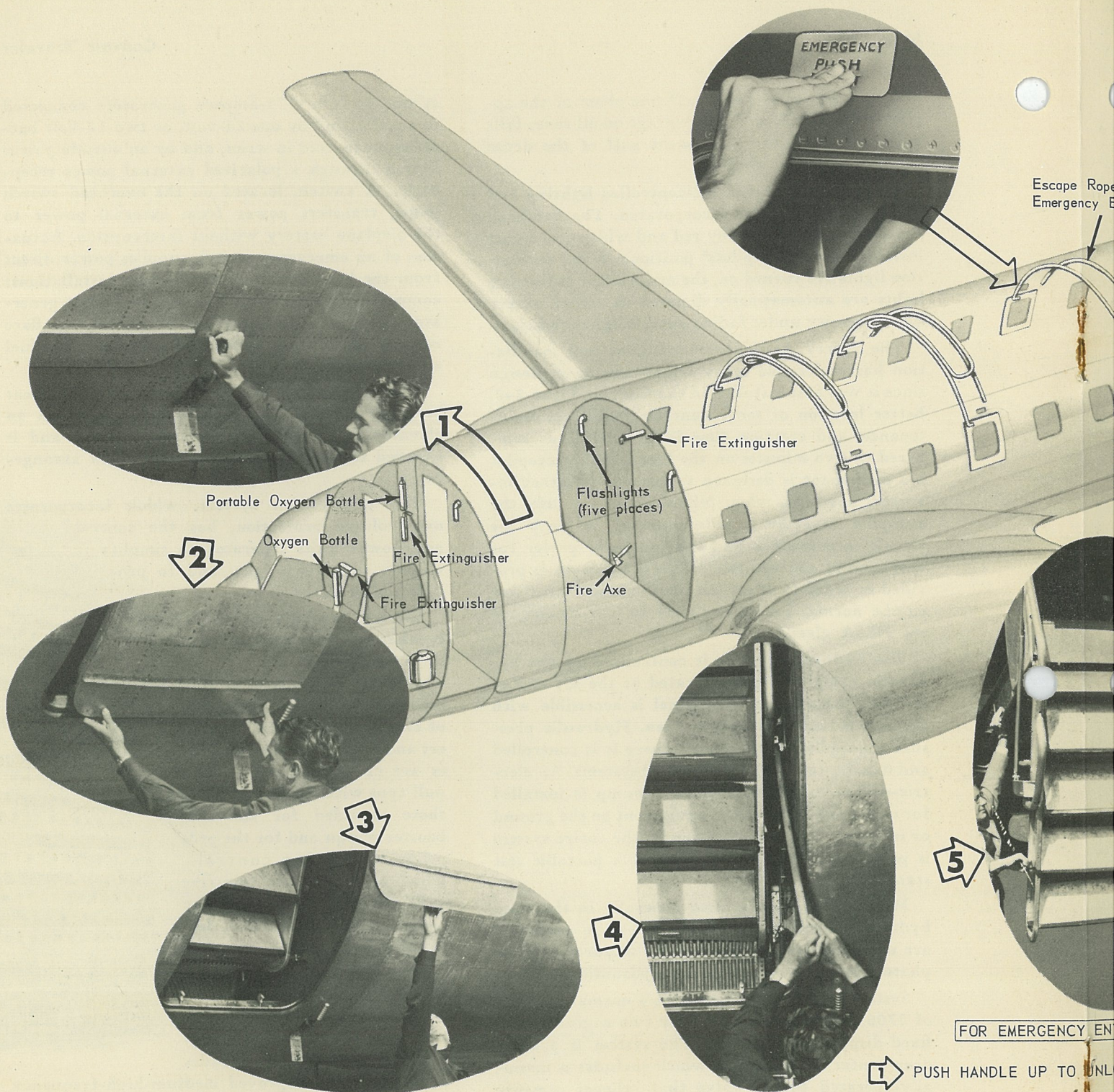
The generators are equipped with overheat warning devices. The battery is mounted on an elevator in the left-hand overflap section and is lowered through a crank and screwjack arrangement.

The distribution system, which incorporates over-voltage protection, has the control and power units separated to simplify wiring, to save weight, and to provide added safety.

Circuit breakers on the circuit breaker panel are grouped together as to function, insofar as is practicable, for easy sequential reading and quick deenergization of circuitry. All circuit breakers and circuit breaker switches are of the trip-free, push-pull type with the exception of those provided for the fuel booster pumps and for the propeller feathering controls, which are of the non-trip-free type. Circuits requiring heavy current, such as starters, hydraulic pump, etc., are protected by current limiters. Circuits drawing less than five amperes are protected by fuses.

The Convair-Liner 340 communication equipment includes many new and improved medium-high-frequency and very-high-frequency radio communication sets, radio navigation aids, instrument landing equipment, and intercommunication facilities. In addition to the communications equipment installed in the Model 240, the 340 has two cockpit loudspeakers for voice communication and aural navigation. Each speaker, located outboard of the pilot and copilot at approximately ear level, is wired through an integral amplifier so that it duplicates the selected headphone audio without affecting the headphone output.





EMERGENCY ENTRANCE AND EQUIPMENT INSTALLATIONS

FOR EMERGENCY EN

- 1 PUSH HANDLE UP TO UNL
- 2 PULL DOOR OPEN.
- 3 PUSH DOOR UP UNTIL UP
LONG STICK MAY BE REQU
- 4 SUPPORT STAIRWAY, AND
NARROW BAR.
- 5 GUIDE STAIRS DOWN.

ape Rope at Each
Emergency Exit

Escape Rope

Fire Extinguisher

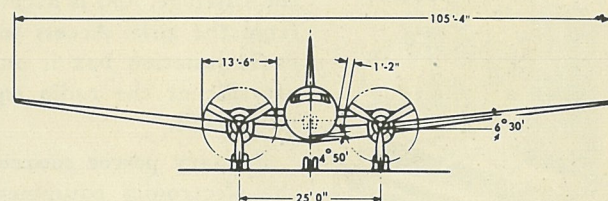
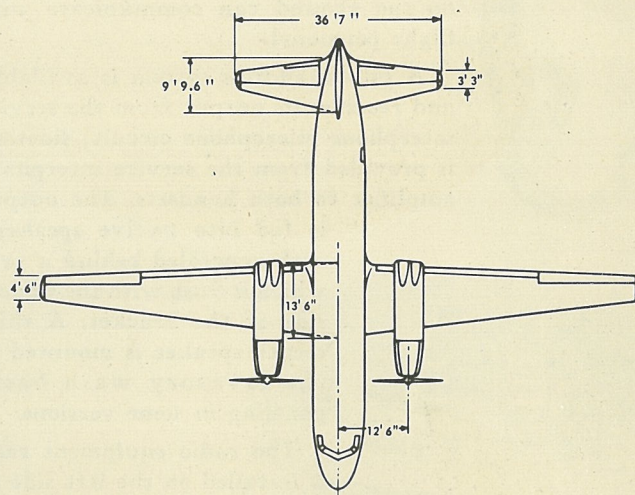
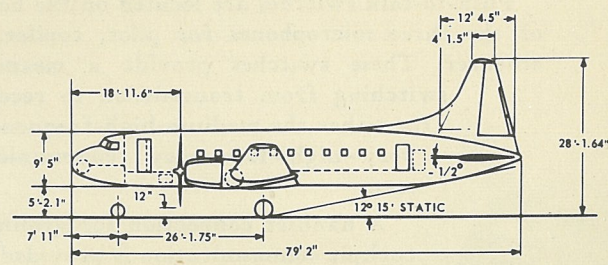
Flare Chutes

FOR EMERGENCY ENTRANCE
Push upward on handle to unlock.

EMERGENCY ENTRANCE

TO UNLOCK DOOR.

FILE UP LATCH ENGAGES.
E REQUIRED.
AND TRIP LATCH WITH



Push-to-talk switches are located on the handles of the three microphones for pilot, copilot, and observer. These switches provide a means for switching from transmission to reception for either the medium-high-frequency or very-high-frequency communication sets.

A handset connection for ground-to-cockpit communication is provided near the ground power plugs so that a man on the ground can communicate with flight personnel.

A public address system is available, and receives its output from the service interphone microphone circuit; sidetone is provided from the service interphone amplifier to both handsets. The output is fed into twelve speakers, each concealed behind a grill which is flush with the underside of the bracket. A thirteenth speaker is mounted in the lavatory wash basin paneling in some versions.

The radio equipment rack is installed on the left side of the fuselage, and is accessible from the aisle. Access to the radio junction box is on the aft side of the radio equipment rack.

Primary power source for the electronics equipment is the airplane 24-28 volt d-c power system. Where needed, individual sets have a dynamotor to convert the airplane power supply to the type of current needed for operation.

A-C power is supplied by the main power inverters and supplies power to the required radio units.

Two omni-mag indicators are installed, one each for the pilot and copilot, to provide combined magnetic heading, omni-bearing selection, and cross-pointer indication.

A radio-magnetic indicator, "RMI," is installed on the pilot's and copilot's instrument panels. The RMI is a dual-indicating instrument with the azimuth scale automatically and continuously set to the aircraft magnetic heading from the remote indicating compass system. These indicators provide automatic presentation of heading and course with reference to omni station and ADF bearing indication.



The Convair-Liner 240 was the first twin-engine aircraft to have a cabin pressure and air conditioning system. Convair, with the assistance of the vendors and airline operators, made many improvements in later Model 240s. Their combined experience has been the guiding factor in the consummation of the excellent design of the pressurization system found in the Model 340.

The primary compressor has been designed for direct attachment to, and operation from, the right-hand accessory pad and drive of the right-hand engine, an arrangement that simplifies maintenance and provides efficient, economical operation of the pressurization system.

All compartments of the airplane are supplied with an air flow of 73 pounds per minute at sea level, and 55 pounds per minute at 20,000 feet. A sea level cabin altitude can be held up to 8900 feet. Above 8900 feet, a maximum pressure differential of 4.16 psi is maintained. Pressurization permits faster climbing and faster descending, without discomfort to passengers. This further increases its block-to-block speed and its revenue-producing potential.

Individual adjustable outlets are provided above each passenger seat so that the supply of air may be directed and/or increased as desired.

Cooling and heating during ground operation are made possible with the new system.

Since the Convair-Liner 240 proved to be an excellent all-weather airplane, it was only fitting that the basic 240 heat anti-icing system be installed in the 340. The systems are similar; however, a few improvements as a result of service experience have been incorporated in the new airplane. One such improvement is a manifold arrangement. On the Model 240, the inboard augmentors furnish heat to the cabin and empennage while the outboard units direct heat to the wing leading edges. On the 340, the augmentors in each nacelle are manifolded to permit the improved distribution of heated air to the cabin and the wing and empennage leading edges.

The Menasco nose landing gear strut that is giving such excellent service on later Model 240s, is installed on the Model 340. In addition, a new steering control system provides improved accessibility and simplified installation and maintenance. The installation can be made on Convair 240s with some minor modifications.

Because of the high utilization realized with the Menasco nose struts, Convair is installing the same type struts on the main landing gear of the 340. Provisions are available for installation of an anti-skid device to increase tire life.

The larger wheels and low-pressure tires permit operation from airports with uneven surfaces or those covered with snow and ice.

Although the Goodrich expander tube brake is standard equipment for the basic airplane, Convair-Liner 340 operators have the choice of this brake or the Goodyear spot type brake. Two types were made available so that operators could select the unit best suited for their particular operations. Many improvements have been incorporated in both assemblies in the past year and they are expected to give excellent service.

Certification stops, satisfactorily demonstrated without the use of reversed propellers, indicate that even greater brake and tire life will be realized in normal propeller-reversed landing roll stops.

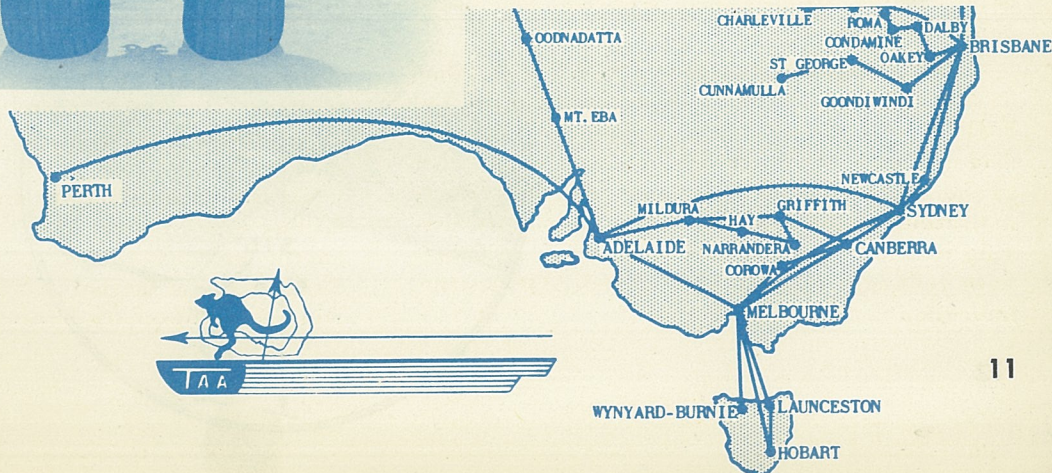
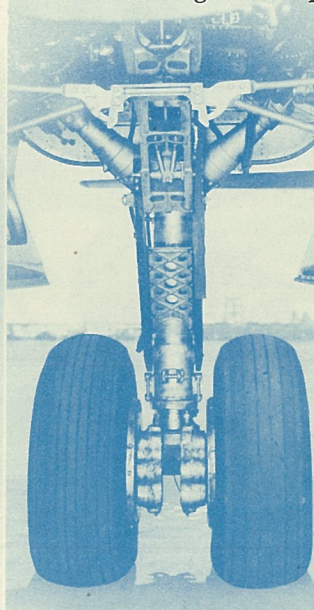
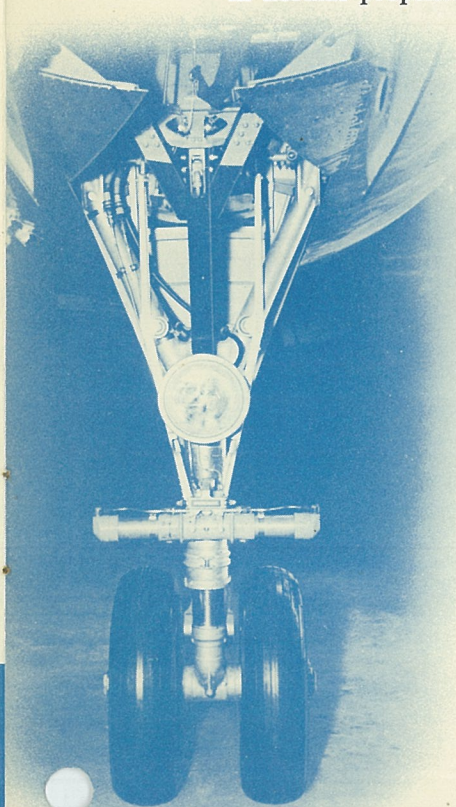
The wing, as installed on the 240, has been replaced with a larger wing, but the same low drag characteristics have been retained. The increased aspect ratio of the 340 wing will provide faster climbs, and operation at higher altitudes with increased cruising speeds at 20,000 feet at low cruise power.

The utility of the 340 is further expanded by the larger integral wing fuel tanks, raising the fuel capacity to 1750 gallons, which is 750 gallons more than carried on early Convair-Liner 240s.

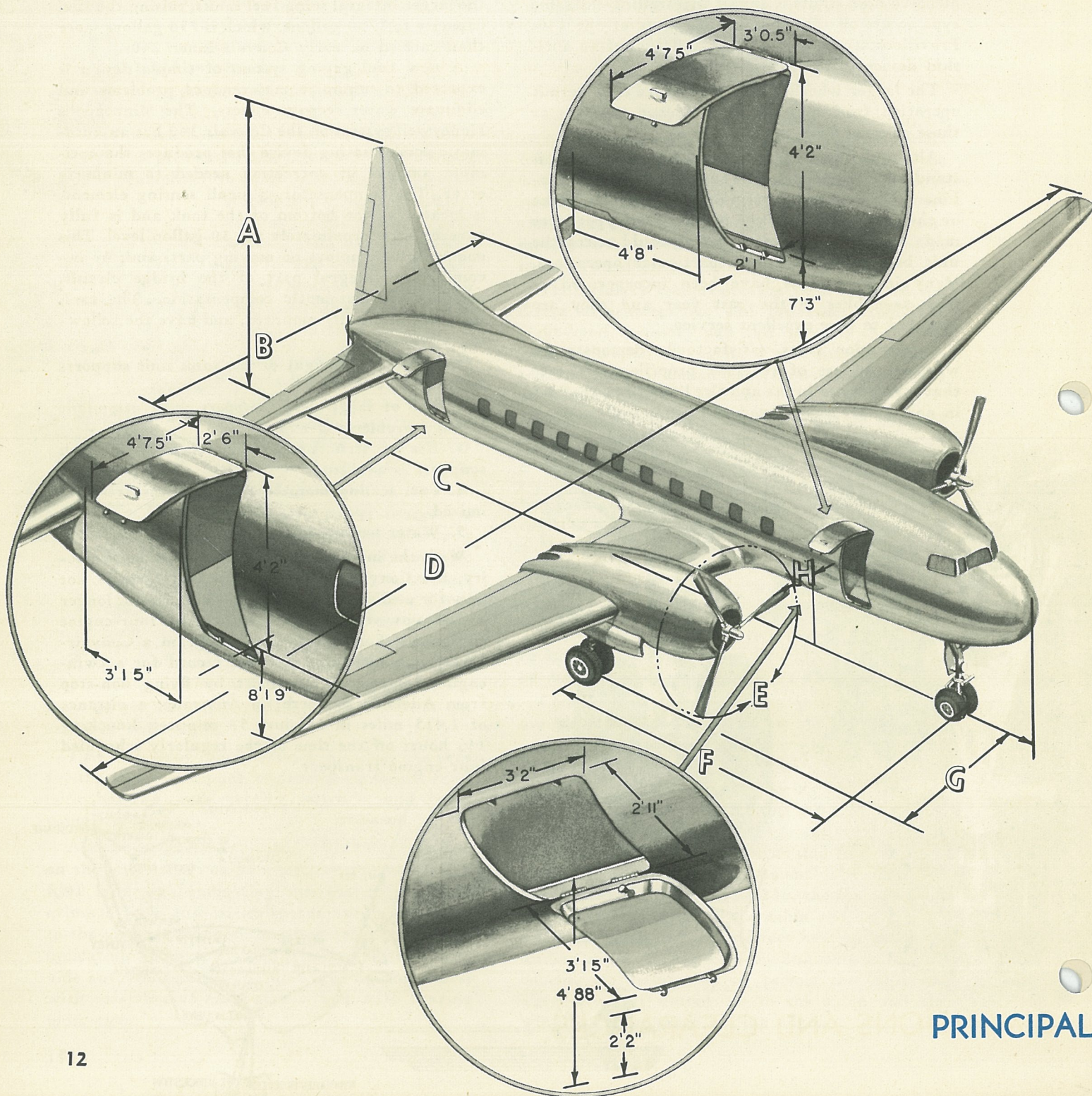
A new fuel gaging system of simple design is expected to minimize maintenance problems and eliminate water seepage effects. The Minneapolis Honeywell system on the Convair 340 has an automatic compensating device that produces the optimum amount of correction needed to minimize error. The compensator, a small sensing element, is located at the bottom of the tank and is fully covered at approximately the 30-gallon level. This compensator employs no moving parts and, by becoming an integral part of the bridge circuit, provides the automatic compensation. The tank units are internally mounted, and have the following advantages:

1. Structural weight of the tank unit supports is reduced.
2. Use of large deep scuppers with attendant leakage problems is avoided.
3. Use of structural doors necessary in such scuppers is avoided.
4. Fuel sealing maintenance problems are minimized.
5. Water seepage into probe heads is eliminated.

With the increase in wing area and fuel capacity, the Convair-Liner 340 can be employed not only for medium-distance routes but also for longer routes now being flown by costly four-engine equipment. Early in the 240 program a Convair-Liner set a new long distance record for a twin-engine commercial transport by flying non-stop from Adelaide to Perth, in Australia, a distance of 1,415 miles in 5 hours 56 minutes, knocking 1½ hours off the time of the regularly scheduled four-engine transport.



A	HEIGHT OF VERTICAL STABILIZER	28' 1.64"	E	OVERALL DIMENSIONS OF PROPELLER	13' 5"
B	LENGTH OF HORIZONTAL STABILIZER	39' 11.05"	F	DISTANCE FROM MLG WHEEL TO NLG WHEEL	26' 1.75"
C	LENGTH OF FUSELAGE	72' 2"	G	DISTANCE FROM MLG WHEEL TO Q. OF AIRPLANE	12' 6"
D	WING SPAN	105' 4"	H	DISTANCE FROM PROPELLER TO FUSELAGE	1' 2"



PRINCIPAL

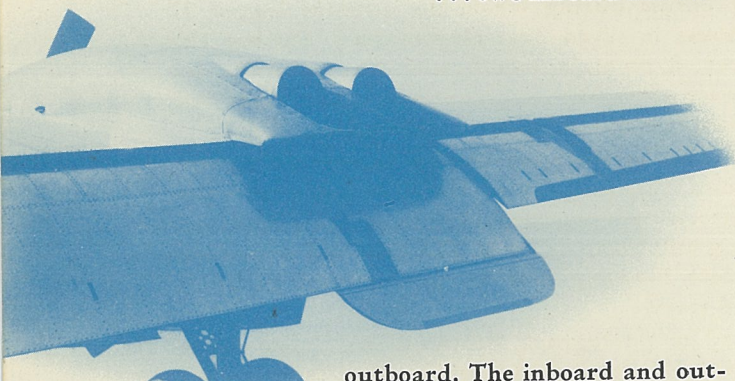
A	NOSE JACK POINT TO GROUND
B	WING JACK PAD TO GROUND
C	TAIL JACK PAD TO GROUND
D	PROPELLER TO GROUND
E	PROPELLER HUB TO GROUND
F	AIRPLANE Q_L TO NACELLE Q_L
G	AIRPLANE Q_L TO MAIN ENTRANCE DOOR STAIRS
H	MAIN ENTRANCE DOOR STAIRS TO PROPELLER

		A	B	C	D	E	F	G	H
1	AIRPLANE IN STATIC POSITION	7' 8.4"	6' 8.8"	7' 6.5"	1' 0.8"	7' 9.3"	12' 6"	8'	4' 8"
2	MAIN AND NOSE GEAR STRUTS EXTENDED - TIRES FULL RADIUS	8' 8.1"	7' 9.3"	8' 7.9"	2' 0.9"				
3	MAIN AND NOSE GEAR STRUTS COMPRESSED - TIRES FLAT	7' 3.3"	6' 0.3"	6' 6.5"	5.8"				
4	NOSE STRUT COMPRESSED - TIRE FLAT; MAIN STRUTS EXTENDED - TIRES FULL RADIUS	6' 9.5"	7' 9.6"	10' 7.1"	1' 2.7"				
5	NOSE AND ONE MAIN STRUT EXTENDED - TIRES FULL RADIUS; OTHER MAIN STRUT COMPRESSED - TIRES FLAT	8' 11.0"		6' 7.6"					
	HIGH WING		7' 11.2"		2' 6.2"				
	LOW WING		5' 9.5"		11.4"				
6	NOSE AND ONE MAIN STRUT COMPRESSED - TIRES FLAT; OTHER MAIN STRUT EXTENDED - TIRES FULL RADIUS	7' 0.4"		8' 7.8"					
	HIGH WING		7' 11.3"		1' 8.8"				
	LOW WING		5' 9.8"		-.2"				



DIMENSIONS AND CLEARANCES

Unlike wing flaps on some two-engine aircraft, Convair's flap is a low drag flap, since it is used for take-off as well as for landing. The greater wing span with no increase in wing chord resulted in a redesign of the Fowler flap as it is used on the Model 240. The 340 flap is in four sections . . . two inboard and two



outboard. The inboard and outboard sections operate in unison; however, the degree of movement of the inboard flap is greater than that of the outboard flap. The Fowler flap, when extended, gives greatly increased lift without undue increase in drag, thus permitting higher take-off and landing loads.

Full extension of the flaps requires approximately 16 seconds, and represents a travel of 45° DOWN for the inboard flaps and 40° DOWN for the outboard flaps. The landing gear warning horn functions with an interrupted sound if the flaps are not down for take-off and throttles are advanced for take-off power. Emergency power for operation of the flaps is derived from the electric pump when the system is in "bypass." There is no mechanical method of direct lowering of the flaps.

The passenger seat on the Model 340 has many of the excellent features that are incorporated in the 240 seat, plus improvements in design. New light-weight fabrics of sturdy construction, and combination hair and Latex foam rubber cushions give it eye appeal as well as additional comfort. Important, too, is a weight saving of approximately 8½ pounds with the new seat.

In designing the 340 seat, interchangeability between the two airplanes was considered so as to help operators minimize their procurement and stocking of spares. With the possible addition of an adapter, the 340 seat can be installed on the 240 airplane. A mechanical seat lock replaces the hydraulic lock and is a maintenance improvement. These locks, too, are interchangeable with the 240 type.

Convair is proud of the recognition received from Crash Injury Research of Cornell University

Medical College, concerning the safety features built into the Convair 240 seat. These same safety features are being retained for the new seat, which has undergone extensive static load tests and has met the design loads of 9 Gs forward, 8.5 Gs downward, 5 Gs upward, and 3 Gs sideways.

Although interest at the present time is focused on the new airplane, Convair has not lost sight of the Model 240. Changes and improvements that will make the airplane more useful to the operator are being studied by engineering. One of these is the fuel dumping installation, a 240 operator development made available by Convair. This system will permit operation at a maximum take-off gross weight of 42,500 pounds, with minor structural modification, so as to maintain virtually the same maximum landing weight. Weight of the entire installation is estimated to be 12 pounds. Convair is in the process of preparing Service Bulletins and kits for accomplishment of this change on Convair 240s.

In four years, Convair-Liner 240s have accumulated the staggering sum of more than four billion passenger miles while establishing an unequalled safety record. This safety record is no accident . . . it is the result of more than twenty-five years of experience in aircraft designing and building, sound engineering, and excellent design.

With the excellent record for safety and utilization obtained with Convair 240s in the past four years, the world's leading airlines find Convair eminently qualified to remain in the commercial transport field. The excellent record established by this first commercial airplane is expected to be duplicated or quite possibly exceeded by the new transport, as evidenced by its excellent performance during the CAA type Certification tests, and accelerated service and CAA acceptance flights.

The Convair-Liner's excellent record for safety, ease of maintenance, and fast, dependable, economical service, plus passenger comfort and satisfaction have resulted in reorders by 10 airlines. At the present time, Convair-Liner operators and purchasers number 28.

Statistics indicate that twin-engine aircraft, such as the Convair 340, are fast entering the operating field of four-engine aircraft. The 340, with a full complement of 44 passengers and baggage, has a range of 1300 miles. Since the majority of domestic flights are in the "under-500-mile" category, it would indicate that there is a growing use for Convair's modern two-engine airplane.

With Convair's excellent reputation for keeping production and flight test schedules, many more Convairs will soon be flying the world's important air routes through the world's leading airlines.



Certification

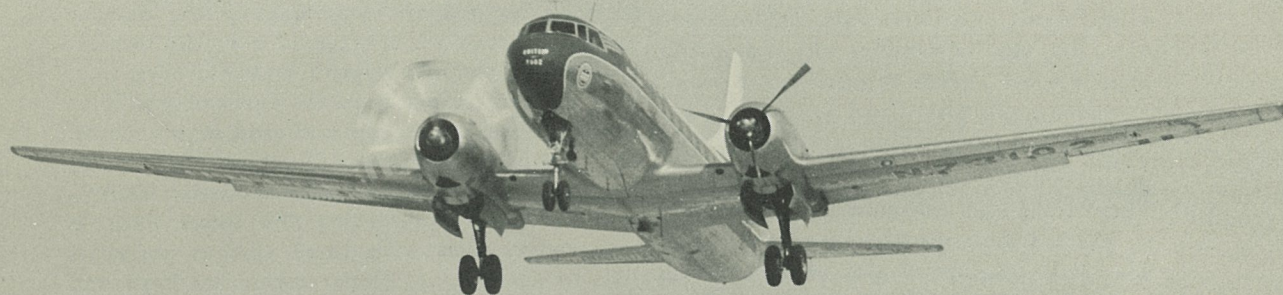
CERTIFICATION of the Convair-Liner 340 was officially accomplished on March 27, less than 80 days after the first CAA flight test of the prototype. The CAA type certificate authorizes the issuance of airworthiness certificates to airlines for operation of the airplane to a gross weight of 46,725 pounds. The Model 340, however, is expected to be approved, after further analysis of data, to operate at 47,000 pounds, enabling airlines to carry even higher loads.

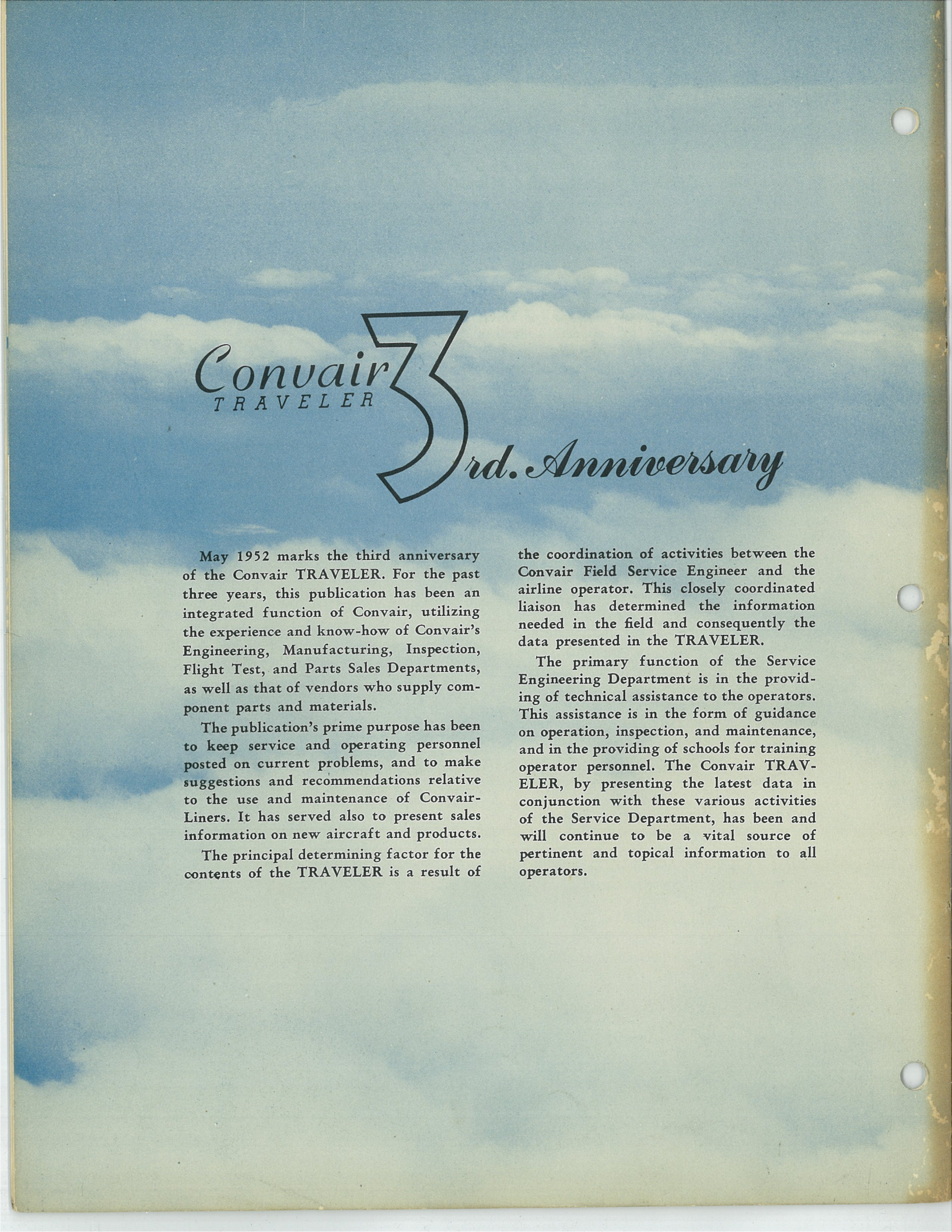
The certificate was issued after extensive tests of the 340 by CAA pilots and engineers, the final phase consisting of an accelerated service

program during which the airplane logged 52 hours in seven days elapsed time. During this period, no major modification was necessary, nor were there any interruptions in the flight test program due to minor modifications.

This certification is of a temporary nature, insofar as delivery of the first few production aircraft is concerned, so as to permit pilot training and route analysis. The final and more complete licensing will be accomplished in 30 to 60 days.

The photograph below shows a one-engine take-off during the certification tests at San Diego.





Convair TRAVELER

3rd. Anniversary

May 1952 marks the third anniversary of the Convair TRAVELER. For the past three years, this publication has been an integrated function of Convair, utilizing the experience and know-how of Convair's Engineering, Manufacturing, Inspection, Flight Test, and Parts Sales Departments, as well as that of vendors who supply component parts and materials.

The publication's prime purpose has been to keep service and operating personnel posted on current problems, and to make suggestions and recommendations relative to the use and maintenance of Convair-Liners. It has served also to present sales information on new aircraft and products.

The principal determining factor for the contents of the TRAVELER is a result of

the coordination of activities between the Convair Field Service Engineer and the airline operator. This closely coordinated liaison has determined the information needed in the field and consequently the data presented in the TRAVELER.

The primary function of the Service Engineering Department is in the providing of technical assistance to the operators. This assistance is in the form of guidance on operation, inspection, and maintenance, and in the providing of schools for training operator personnel. The Convair TRAVELER, by presenting the latest data in conjunction with these various activities of the Service Department, has been and will continue to be a vital source of pertinent and topical information to all operators.

Convair

TRAVELER



JULY 1952

CONSOLIDATED VULTEE

AIRCRAFT CORPORATION

SAN DIEGO, CALIFORNIA

VOLUME IV

NUMBER 3

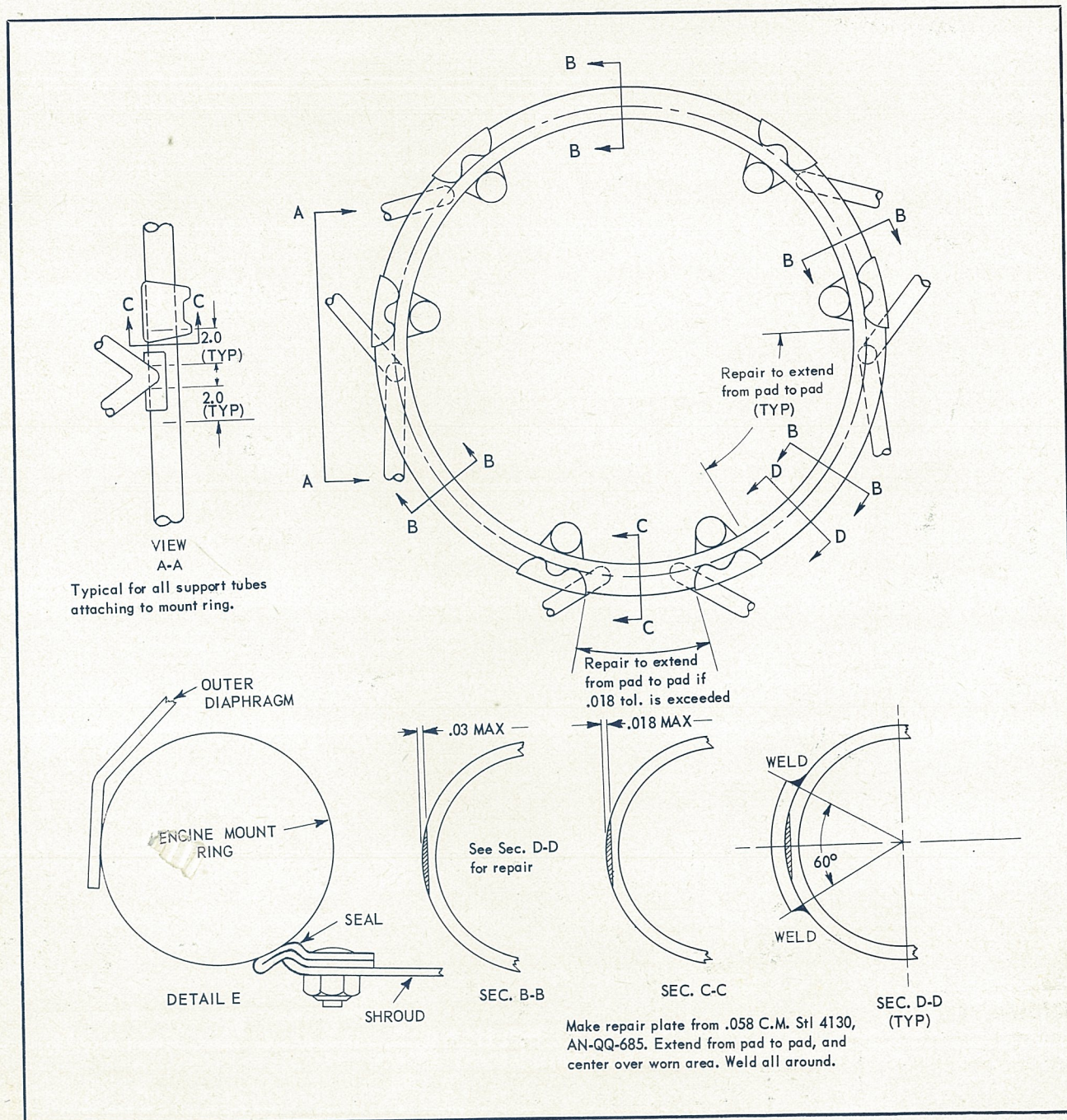
ENGINE MOUNT ASSEMBLY REPAIR

Illustrated below are typical engine mount repairs. When the engine mount ring is worn below the tolerance shown in Section C-C, and the wear area does not extend more than two inches on either side of the support tube attachment (see View A-A), a repair is required and can be made. For other areas, wear beyond the tolerance shown in Section B-B requires repair. Repairs should be

made as illustrated in Section D-D and as noted. ALL WELDING SHOULD BE HELI-ARC.

The diaphragm and/or shroud should be hand-formed or reworked in area of weld plate to provide less than .040 inch maximum gap between mount ring and diaphragm and/or shroud, as shown in Detail E.

These repairs are applicable to all Convair- Liner engine mounts.



ON THE COVER

A Convair-Liner 240, in the service of Trans Australia Airlines, on May 16 logged its ten-thousandth hour and, by so doing, gained the distinction of being the first Convair to attain this record. Completing this number of flight hours so soon after original certification of the type is probably a world record for any type airplane.

The plaque pictured on the cover was presented by Convair to the airline, commemorating the achievement.

The following cablegram was received by Convair from Brown and Dureau, Manufacturer's Representative for TAA:

"TAA CV240 VH-TAR SERIAL 92 COMPLETED 10,000 FLIGHT HOURS TODAY *stop* THIS REPRESENTS OVER 11,000 BLOCK HOURS AND 67 MILLION REVENUE PASSENGER MILES PERFORMED SINCE DELIVERY AT SAN DIEGO ON OCTOBER 8TH 1948 *stop* WE BELIEVE THIS WORLD RECORD AND JOIN WITH TAA EXTENDING CONGRATULATIONS YOUR PRESIDENT AND ALL CONCERNED AT CONVAIR . . . DUREAU"

An excerpt from a congratulatory note further stated, "Mr. Watkins and the TAA management join with us (Brown and Dureau, Ltd.) in conveying sincere congratulations to Convair as designers and manufacturers of this outstanding airplane, and we feel sure you will enjoy even greater success with the Convair 340."

At the inception of the airline in 1946, it was the aim and desire of TAA executives and staff to build and maintain a reputation for efficient,

courteous, and safe operation and to offer the finest available equipment. This thinking over the past six years has been rewarded with growth and prosperity, and with the confidence and support of the traveling public.

In retrospect, a TAA Convair reached the one-millionth passenger mile approximately seven months after delivery to the airline. Its high utilization . . . averaging 8.93 block hours per day and on many occasions at a 92-percent load factor, made possible this first record in May 1949.

In November of that year, a TAA Convair set a new long distance record for a twin-engine airplane by flying non-stop from Perth to Adelaide, a distance of 1415 miles in 5 hours 56 minutes, knocking 1½ hours off the time of the regularly scheduled four-engine transport.

In December of 1949, TAA broke three of their own flight records on the same route . . . Melbourne to Sydney, a distance of 455 miles but on different schedules. Block to block time for the first flight was 1:30; the second flight bettered this by one minute; the third flight was made in the record time of 1:27 minutes.

Three other TAA Convairs are on the verge of completing 10,000 hours in the air. The total fleet of five airplanes on May 19 completed 46,000 flight hours, 50,500 block hours, and approximately 309 million revenue passenger miles.

These accomplishments give every indication that breaking records is routine with TAA.

PLEASE NOTE—In the June 1952 issue of the Convair TRAVELER, make the following corrections and additions to article, titled "Convair-Liner 340 Propeller System."

1. Page 21, paragraph D: Change last sentence to read, "When unreversing, the feathering pump is stopped by action of the No. 1

blade limit switch approximately 5° to 7° AFTER the low-pitch limit of 30° is reached.

2. Page 23, paragraph C: Change the next to last sentence to read, "After the propellers have started to windmill, and approximately 25° BEFORE the blades reach the low-pitch angle . . ."

The Convair TRAVELER

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San Diego, California

July 1952

A digest of Convair-Liner operation and service published monthly by Convair in the interest of Convair-Liner operators and for the promotion of sales and service. Communications should be addressed to Chief of Service, Convair, San Diego 12, California.

F. W. Fink, Chief Engineer

J. J. Alkazin, Chief of Service

G. S. Hunter, Editor

The information published in the Convair TRAVELER is to be considered accurate and authoritative as far as Convair approval is concerned. CAA approval, however, is not to be implied unless specifically noted. Airline personnel are therefore advised that use of this material may be restricted by their respective company policies or by CAA publications. Permission is hereby granted to republish any information here presented, but it is suggested that the material be verified with Convair to insure that it conforms with latest changes and developments.

VOLUME IV

Number 3

31

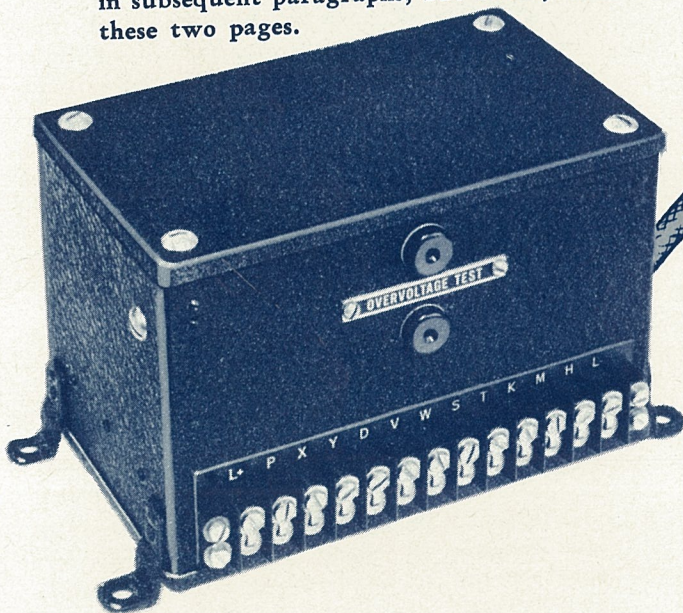
D·C POWER

CONVAIR-LINER

340

The Convaire-Liner 340 employs an Eclipse-Pioneer system for the generation and control of the primary electrical power, which is generated at a nominal 28 volts direct current. This system, which affords protection against virtually any type of "fault" that may occur in any operating condition is schematically illustrated on pages 36 and 37. The various types of faults against which protection is afforded are overvoltage, ground fault, and excessive reverse current.

The system is composed essentially of the following components: Generator, Control Panel, Line Contactor, Main Circuit Breaker, and Overvoltage and Fault Detector Panel. These components are discussed in detail in subsequent paragraphs, but briefly their functions are as described on these two pages.

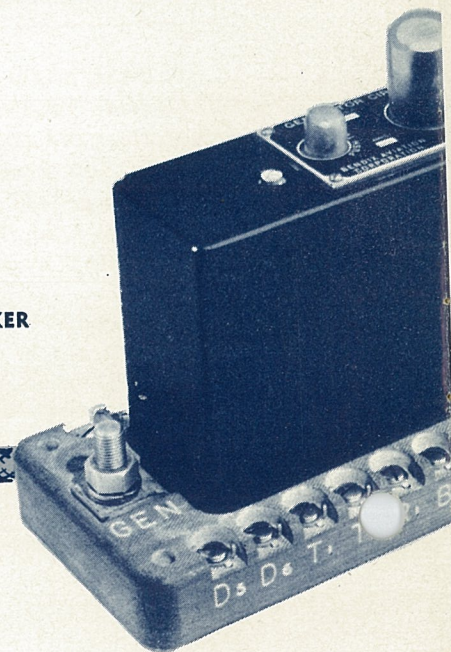


VOLTAGE REGULATOR AND FAULT DETECTOR PANEL

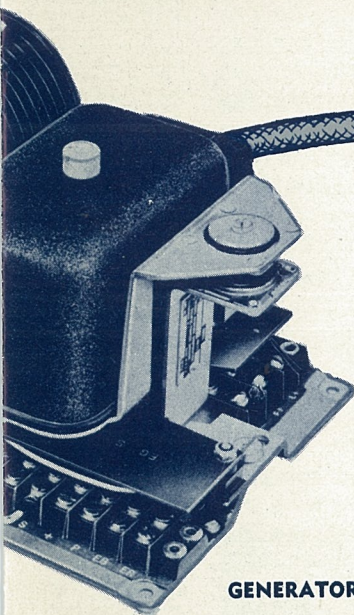
This panel contains a conventional carbon-pile with its associated voltage control and equalizer coils, as well as an adjustable rheostat. An overvoltage sensing relay and a circuit containing a negative temperature coefficient resistor serves to compensate for the change in relay coil resistance with temperature. Included also in the panel are a differential-voltage and reverse-current relay, a pilot relay, and a paralleling relay.

MAIN CIRCUIT BREAKER

This breaker has several important functions. It provides "back-up" protection in case of any type of failure of the normal reverse current removal of a low-speed or otherwise low-voltaged generator from the bus; it will detect a fault to ground on the generator feeder, if the "fault" current is in the vicinity of 300 amperes, and remove the generator from the bus. Upon a signal from the fault detector panel, it will open its own line contacts, open the generator field circuit on both sides of the carbon pile in the voltage regulator, and open the line contactor.

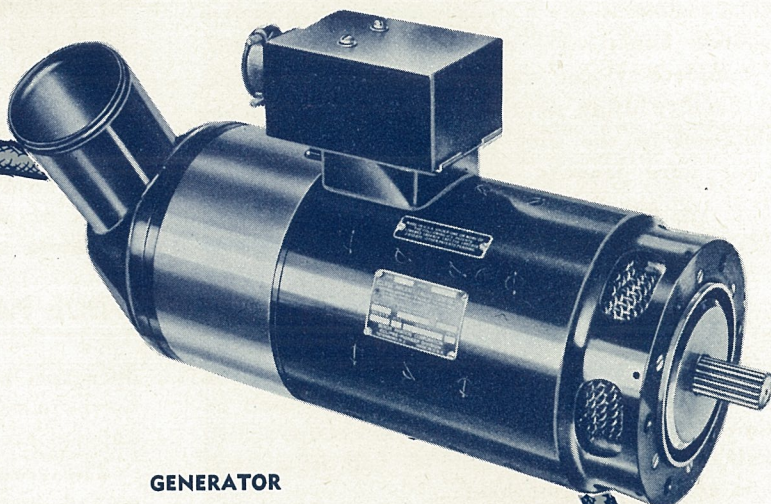


SYSTEM



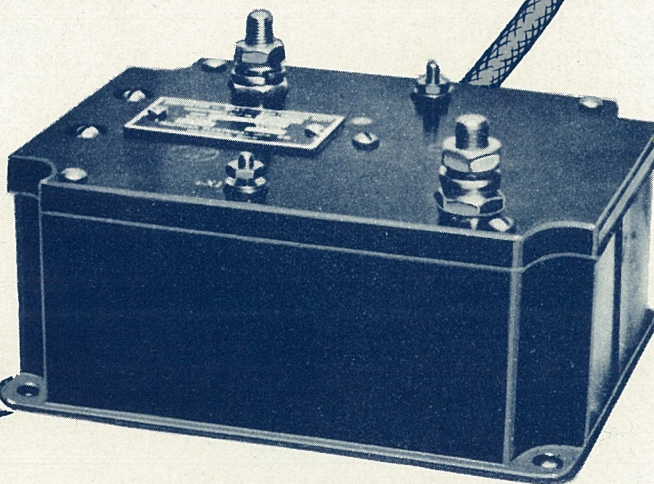
GENERATOR CONTROL PANEL

This panel maintains a substantially constant d-c generator voltage, despite variations in generator speed and load, and equalizes the load division between two or more generators operating in parallel. In addition, it controls the operation of the generator line contactor, permitting generator connection to the bus when generator voltage exceeds bus voltage by a fixed amount, and disconnecting the generator, should the latter draw reverse current of a specified amount due to low voltage from any cause.



GENERATOR

The Eclipse Pioneer 28-volt, engine-driven generator is an air-blast cooled, self-excited unit that operates through a speed range of 3450 to 8500 rpm. It has a continuous rating of 375 amperes (4000 to 7000 rpm) at 8" H₂O, with an overload rating of 400 amperes (5000 to 7800 rpm) at 12" H₂O for a period of 30 minutes. These ratings will satisfactorily handle loads on the 340 during single-engine operation.



MAIN LINE CONTACTOR

This unit connects the generator to the bus or removes it from the bus under specifically controlled conditions. It is of the heavy-duty type and is designed for 28-volt service. It has a high current-interruption capacity, and its operation is fast and dependable. It is controlled by the pilot's switch and the reverse-current differential-voltage relay.

Convair Liner 340 D-C Power System (Cont)

Several components of the D-C power system are of entirely new design and therefore have not been subjected to any operational usage. Because of this, and to secure a more complete knowledge of system functioning under various conditions, the complete system was set up in an Electrical Test Facility using data secured from the actual installation in the first production airplane for critical wire lengths. Tests, conducted under normal and abnormal conditions, showed the generators to be capable of withstanding adverse con-

ditions beyond their nameplate ratings. Their inherent regulation is such that a usable voltage under regulation is maintained even at lower-than-rated speeds. Under sustained ground faults, the generator output will not build up after its shunt field is opened.

Overall system performance, too, was excellent under all conditions. The integrated functions of the various units are such that maintaining d-c power for the airplane is semi-automatic, and in-flight adjustments are unnecessary. A complete check of the entire system can be made with a minimum of time expenditure.

GENERATOR CONTROL PANEL

The control system can cope with an extreme condition in which one generator is operated at minimum speed and the other at maximum speed. At full system load there is only 0.7 volt differential in bus voltage from no-load.

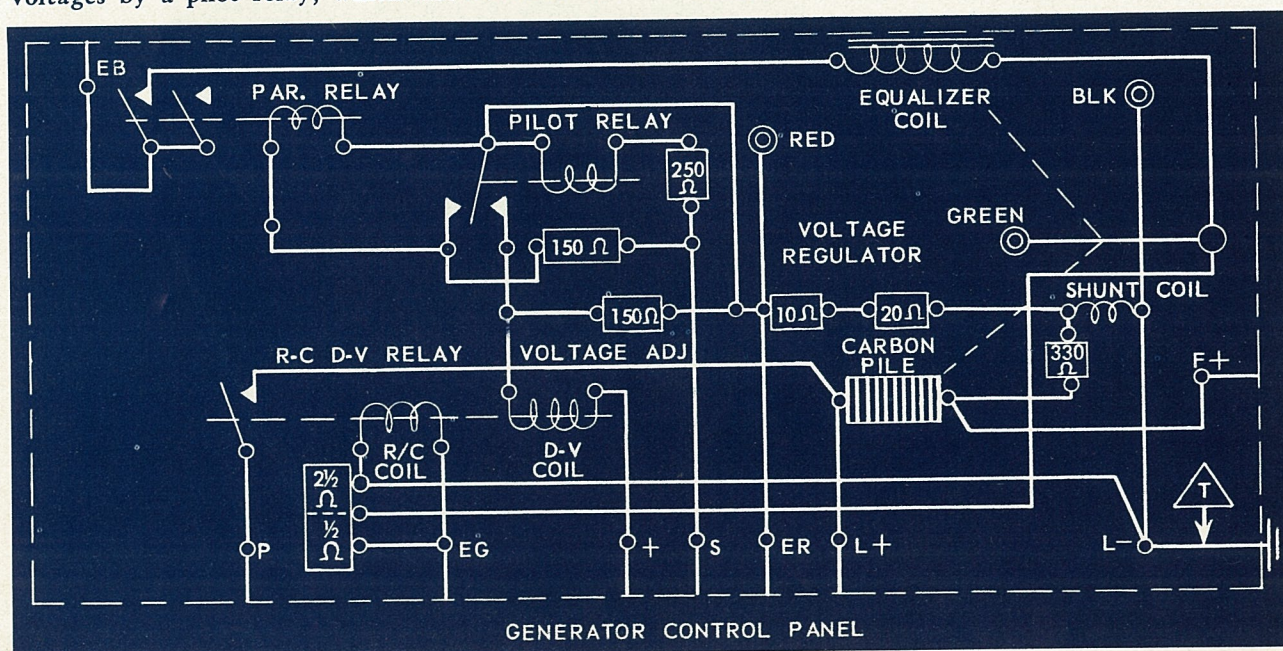
The generator control panel contains a reverse-current differential-voltage relay whose function is to control the line contactor under the conditions given above.

The differential coil of the relay is connected essentially between the main bus and the positive terminal of the generator concerned; it is thus exposed to the voltage differential existing between these points. When this voltage (with that of the generator the greater) equals or exceeds that for which the relay has been set, the relay will close and connect the generator to the bus. The coil of this relay is protected against excessive differential voltages by a pilot relay, which also controls the

operation of a paralleling relay, which in turn serves to open and close the equalizer circuit under appropriate conditions.

The reverse-current coil of this relay is connected, essentially, across the series and compensating windings of the generator in series with the negative leads and the ammeter shunt. A reverse current of the correct magnitude through these elements will cause the relay to open and disconnect the generator from the bus.

Pull-in and drop-out voltages of the relays in the control panel may be adjusted to meet the specific requirements of the circuits in which they are used. The pull-in voltage of the pilot relay determines the value of differential voltage at which the differential-voltage relay becomes sensitive. This function is accomplished, when the pilot relay closes, by its contacts completing a circuit to "short-out" a 150-ohm resistor which is in series



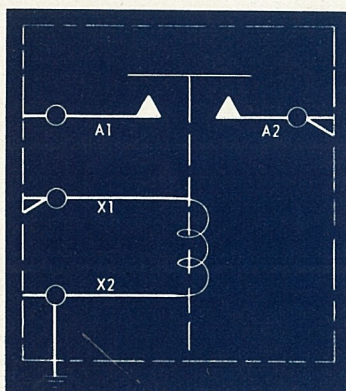
with the differential-voltage relay coil. The full voltage which exists between the generator and the bus is then applied to the differential-voltage relay coil. At the same instant, the armature of the pilot relay removes the short circuit which has existed across the paralleling relay coil, and causes the equalizer circuit in that control panel to be completed. For two-generator operation an identical sequence in the other control panel would complete the equalizer circuit between the two generators.

In the case of two-generator operation, the operating voltage values of the pilot relay become important in that the action of this relay may affect the system bus voltage through its control of the equalizer circuit. This condition exists only when one generator is seriously below its minimum rated speed while the other is at some speed above its low speed minimum. This will occur, therefore,

while one engine is being shut down at a time when the other is above 1150 rpm, or when one engine is above 1150 rpm and the other one is being brought up to speed.

The circuit functioning under condition of one engine shut-down is explained as follows: As the engine rpm is reduced below approximately 1150, the generator on its pad can maintain its voltage only through equalizer action. This, however, is limited (and dependent on generator load), and the action which attempts to raise the low-speed generator voltage also acts to reduce the voltage of the normal machine. As a result, bus voltage is reduced below normal until the equalizer circuit is opened. The magnitude of depression of bus voltage is independent of the speed at which the "normal" generator is operating, but is a function of initial generator load. The duration of this depression is a function of both the drop-out value of the pilot relay and the deceleration of the engine.

GENERATOR MAIN LINE CONTACTOR



The generator line contactor serves as a semi-automatic switch for connecting the generator to the bus or for removing it from the bus. It is controlled by both the pilot's switch and the reverse-current differential-voltage relay, and its contact position (assuming no

malfunctioning) is indicated by the generator-inoperative light on the overhead switch panel.

The line contactor is of the heavy-duty, magnetic blow-out type and was originally designed for 120-volt direct current service, but has been modified, as far as the operating coil is concerned, for 28-volt service.

The particular type of contactor used was chosen for its high current-interruption capacity and for its speed and dependability of operation. Operation of the contactor proved very satisfactory during all tests made on the system.

MAIN CIRCUIT BREAKER AND FAULT DETECTOR PANEL

The primary function of the main circuit breaker is to remove the generator (with which it is associated) from the bus in the event of one or more of the following fault conditions:

1. Overvoltage due to any cause.
2. Ground faults which occur in the generator feeder (i.e., between the main circuit breaker and the generator B+).
3. Excessive reverse current, which could occur in the event of malfunctioning of the reverse current relay or the main line contactor.

In providing for protection against these faults, the circuit breaker operates in conjunction with the fault detector panel. The manner in which these units operate during each of the foregoing fault conditions will be explained in the following paragraphs.

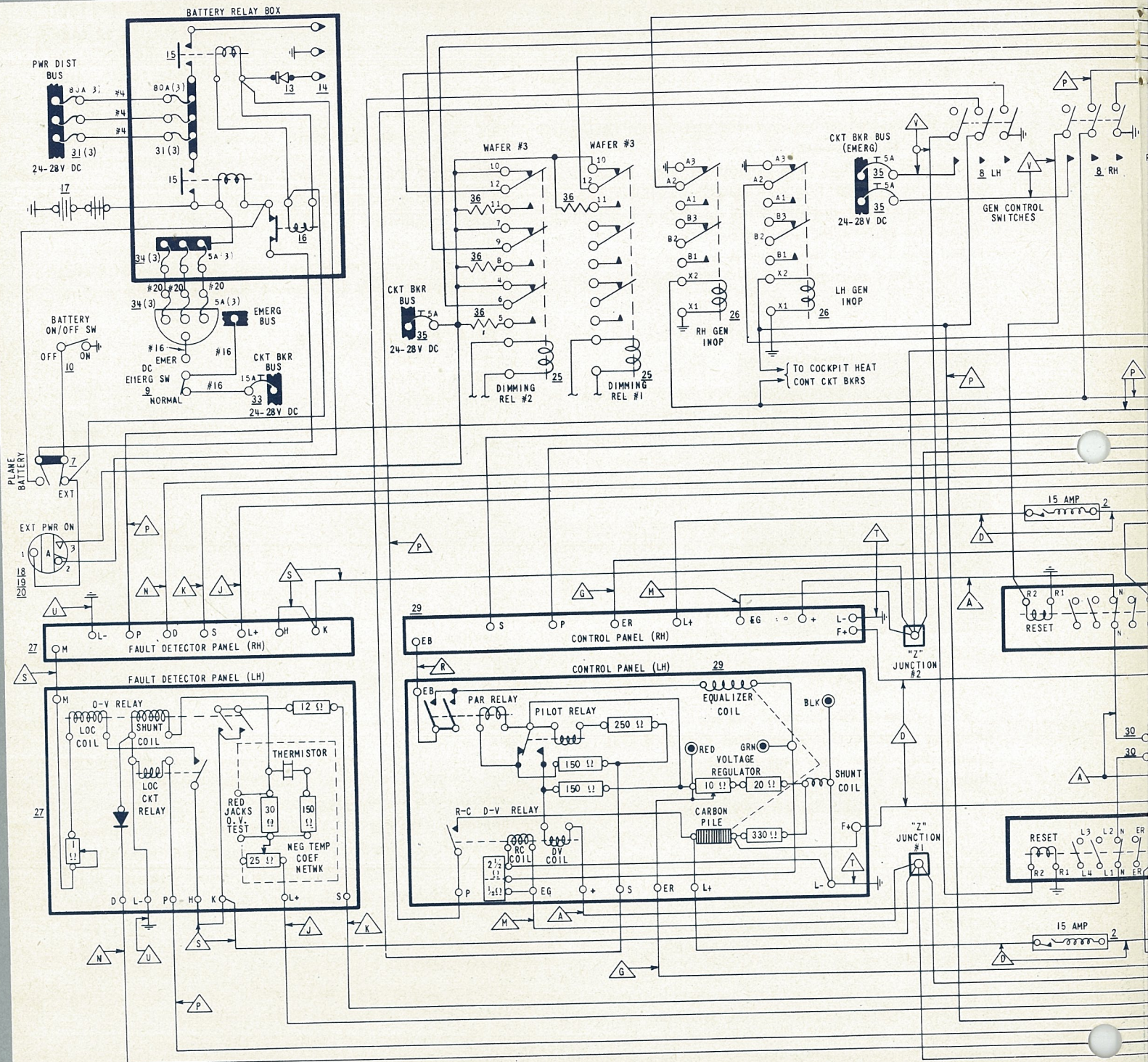
A. OVERVOLTAGE.

The adverse effects of a maintained overvoltage condition on the d-c bus are undesirable to electrical system designers to such an extent that few modern commercial airplane systems are without overvoltage protection. Momentary overvoltage conditions which exist during fault sensing may do no damage provided that the protective system acts quickly and surely. The Eclipse-Pioneer system utilizes an overvoltage sensing coil coupled with a locator coil to sense and to locate the overvoltage generator, and a main circuit breaker to remove that generator from the bus.

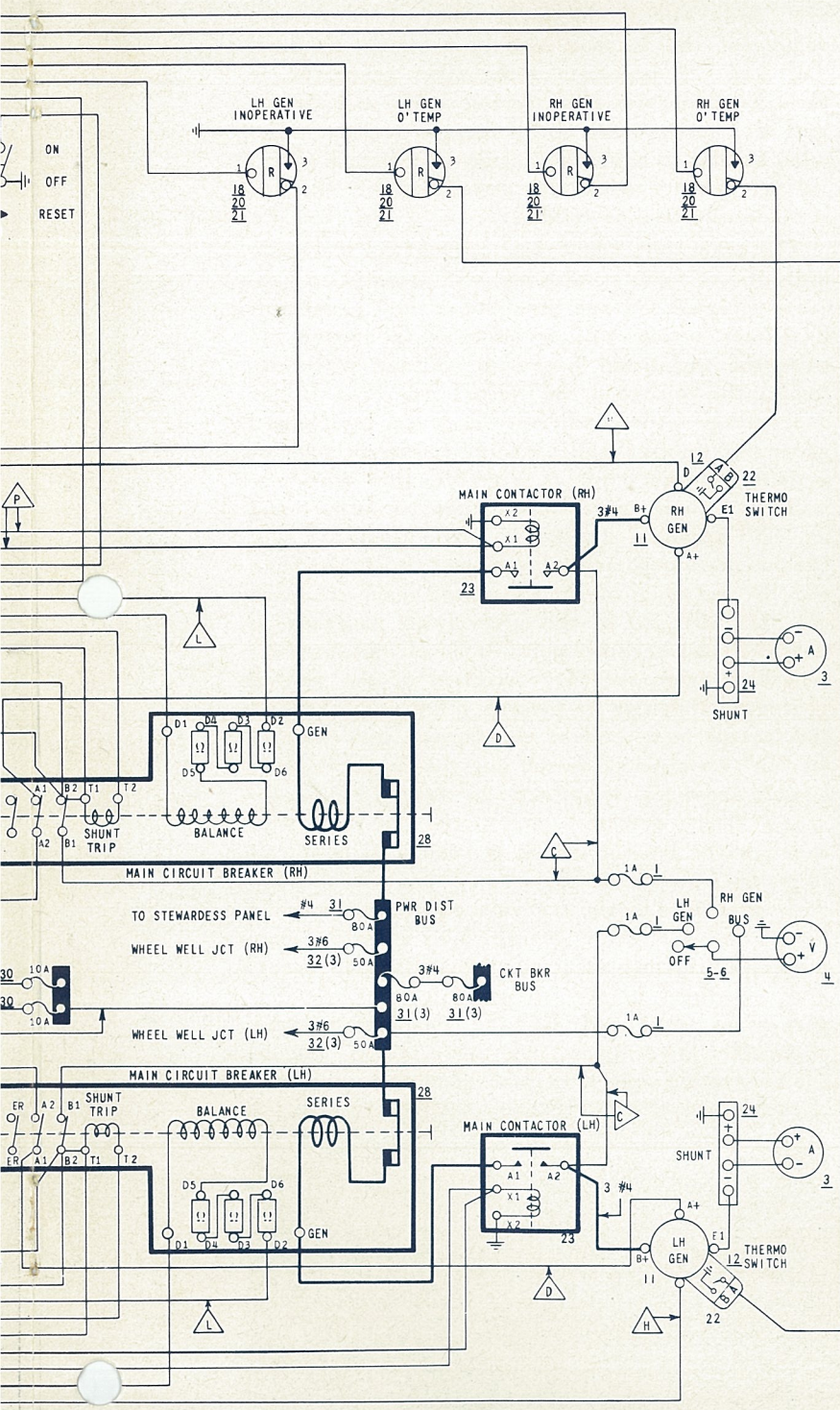
The sequence of events in the case of an overvoltage during one-generator operation follows.

(Continued on page 38)

D-C Power System Schematic



Schematic Diagram



ITEM	PART NAME	VENDOR	VENDOR NO.	RATING	REG.
1	Limiter	Burndy	FIL01	1 amp	3
2	Ckt Bkr	Heinemann	AM-13	15 amp	2
3	Ammeter	G-E	8DN4-ACA-205		2
4	Voltmeter	Weston	840 type 21Z2		1
5	Switch		AN3211-1		1
6	Knob		AN3220-2		1
7	Switch	C-H	8906K513		1
8	Switch		AN3227-5		2
9	Switch		AN3021-3		1
10	Switch		AN3021-2		1
11	Generator	Eclipse	30E02-9-C		2
12	Thermo Sw	Eclipse	857470-2		2
13	Rectifier	Vickers	22-554		1
14	Recept		AN2552-3A		1
15	Relay		AN3380-2	400 amp	2
16	Relay	Elec Prod	NS-47-EK	25 amp	1
17	Battery	Exide	12-TAS-13F		1
18	Bulb		AN3121-313		5
19	Cap	Korrry	AAL		1
20	Base	Korrry	130		5
21	Cap	Korrry	ARL		4
22	Plug	Cannon	3108F-8S-1S		2
23	Relay	Hartman	A-751D	Main Con.	2
24	Shunt			D-C Gen	2
25	Relay	Price	8002-12		2
26	Relay	Leach	237EAU		2
27	Det Pan.	Eclipse	35E05-2-A		2
28	Gen Ckt Bkr	Eclipse	35E04-1-A		2
29	Cont Pan.	Eclipse	1539-9A		2
30	Limiter	Burndy	FIL10	10 amp	2
31	Limiter	Burndy	FLLB	80 amp	13
32	Limiter	Burndy	FLLA	50 amp	6
33	Ckt Bkr	Spencer	D-6751-1-15	15 amp	1
34	Limiter	Burndy	FIL05	5 amp	6
35	Ckt Bkr	Spencer	D6751-1-5	5 amp	3
36	Resistor	Int'L Res	Type BW-1	100 ohm	4

MAXIMUM RESISTANCE OF LEADS ON ECLIPSE-PIONEER GENERATOR SYSTEMS

Δ	LEAD FROM	RESISTANCE
A	Main Bus to "N" on 35E04	.25 Ohms Max.
	"N" on 35E04 to "+" on 1539	Total
C	Input side of A-751D to "B1" on 35E04	.017 Ohms Max.
	"B2" on 35E04 to "L+" on 1539	
D	"F+" on 1539 to "A2" on 35E04	.17 Ohms Max.
	"A1" on 35E04 to "A+" on Gen.	Total
G	"B2" on 35E04 to "ER" on 1539	.25 Ohms Max.
H	"D" on Gen. to "Z" Junction	.10 Ohms ± 25%
J	"T1" on 35E04 to "L+" on 35E05	.5 Ohms Max.
K	"T2" on 35E04 to "S" on 35E05	
L	"D2" or "D3" on 35E04 to "Z" Junction	.02 Ohms Max.
M	"Z" Junction to "EG" on 1539	.05 Ohms ± 25%
N	"D" on 35E05 to "D1" on 35E04	.03 Ohms ± 25%
P	"P" on 1539 to +Coil on A-751D	1.0 Ohms Max.
	"+" on A-751D to "P" on 35E05	Total
R	"EB" on 1539 to "EB" on 1539	.02 Ohms Max.
	"Z" Junction to "K" on 35E05 to "H" on 35E05 and "M" on 35E05 (external wiring only) thru same circuit to #2 "Z" Junction	.07 Ohms Max.
S		Total
T	"L-" on 1539 to ground	.01 Ohms Max.
U	"L-" on 35E05 to ground	
V	Main bus to "R2" on 35E04	.1 Ohms Max.

NOTES: 1539 Denotes CONTROL PANEL
A-751D Denotes MAIN CONTACTOR
35E04 Denotes GEN CIRCUIT BREAKER
35E05 Denotes FAULT DET. PNL.

Values above determine max resistances of connecting leads for each generator system except circuit "S" which is common to both.

The overvoltage sensing coil receives the overvoltage signal through the temperature compensating network and the contacts B_2-B_1 of the main circuit breaker, from the terminal A_1 on the main line contactor (which is connected directly to the generator $B+$ terminal). When the d-c bus reaches a voltage of $33 \pm .5$ volts, the coil will be energized and the overvoltage contacts (between terminals S and K of the fault detector) will be closed. Closing of these contacts completes a circuit from the generator $B+$, through B_1-B_2 and the shunt coil, through the contacts to the "Z" terminal and ground. This coil is a trip coil for the breaker and, upon its energization, the breaker is tripped, removing the generator from the bus. Although the auxiliary contacts in the breaker open the field circuit on both sides of the carbon stack, under A-B (full-field) faults, the generator will maintain an overvoltage as long as the A-B short circuit exists. This voltage is a function of speed and fault resistance, and will vary from 60 to 140 volts at generator speeds ranging from 4000 to 8000 rpm respectively. This voltage does not appear on the bus but does cause excessive current to flow through the generator shunt field. Under flight conditions, the generator could be spared possible damage only by engine shut-down.

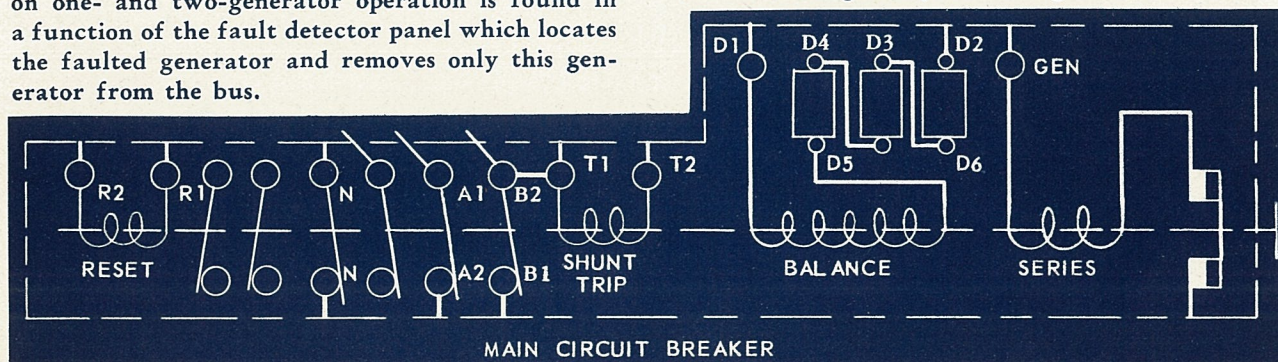
For an overvoltage caused by an open or a high resistance in the regulator control circuit, the system operates exactly as explained above with the exception that, after the circuit breaker operates to remove the generator from the bus, the generator terminal voltage drops to a residual value of 5 to 8 volts.

Opening of the main circuit breaker also removes the source of voltage at the coil of the line contactor and at the generator-inoperative light relay. The line contactor opens and the generator-inoperative light illuminates, giving the pilot an indication that the generator has been removed from the bus.

A generator, faulted during parallel operation, is removed from the bus in essentially the same manner. The basic difference between system action on one- and two-generator operation is found in a function of the fault detector panel which locates the faulted generator and removes only this generator from the bus.

When the pilot's switch is closed, the generator will be put on the bus (assuming its voltage is high enough) by the action of the differential-voltage relay which applies bus voltage to the line contactor coil, the inoperative relay coil, and the locator circuit relay coil. Energizing the locator circuit relay closes contacts between the terminals "H" and "M" of the fault detector panel, and completes the locator circuit between terminal "M" and "Z" junction of the other generator. If the other generator is on the bus, its locator circuit will also be complete and a locator action (somewhat similar to equalizer action) is affected. Overvoltage sensing with two generators on the bus is made selective as follows:

The generator, whose field current is excessively high due to fault conditions, will attempt to generate a higher voltage than the normal generator. Equalizer action will be such as to attempt to raise the unfaulted generator voltage while reducing the voltage of the faulted generator. Under overvoltage fault conditions, however, the faulted generator voltage will continue to rise in spite of equalizer action and, as a result, this generator will carry more of the load than the other, and its "D" terminal (hence its "Z" junction) will become more negative with respect to ground than the "D" terminal of the unfaulted machine. Since the "D" terminal of the overvoltage generator is now the most negative point in the circuit, current will flow from the "D" terminal of the normal generator through its locator relay coil, through the locator relay coil of the faulted generator to its "D" terminal. Flow of current in the locator circuit produces two effects: In the normal generator's fault detector panel, the current flow through the locator coil is in such a direction as to produce ampere-turns which oppose the ampere-turns produced by the overvoltage relay, effectively raising its trip value setting. This same current, flowing in the locator circuit of the faulted generator, produces ampere-turns which aid the ampere-turns produced by the overvoltage coil, effectually lowering its trip value setting. Hence, the overvoltage relays of both generators sense the



fault while the locator relays help to select the generator to be removed from the bus. Removal of the faulted generator is then accomplished, and the locator circuit is opened at the same time the line contactor opens and the inoperative light is energized.

For overvoltage faults occurring at no-load or at low-load conditions, the unfaulted generator will be removed from the bus before the faulted generator. This removal is effected by reverse current through the generator and is a more or less desirable condition provided it will be automatically reconnected to the bus upon removal of the faulted generator.

B. GROUND FAULT.

Included in the functions of the fault protection system is the sensing of feeder faults to ground. In the event any point in the generator feeder (from B+ to the "Gen" terminal of the breaker) becomes grounded, the system will act to isolate the fault and the generator from the bus, and will cause the generator field to open, rendering the generator inoperative. If the fault should occur on the multiple feeder between the line contactor terminal A₂ and the breaker terminal "Gen," it will be completely isolated from any power source and the inoperative generator will not supply current to it. Should the fault occur at any point between B+ and A₁ (line contactor), it will be fed by the generator as long as it maintains a circuit to ground. Such a condition would be indicated by deflection of the loadmeter of a generator which is not connected to the main bus.

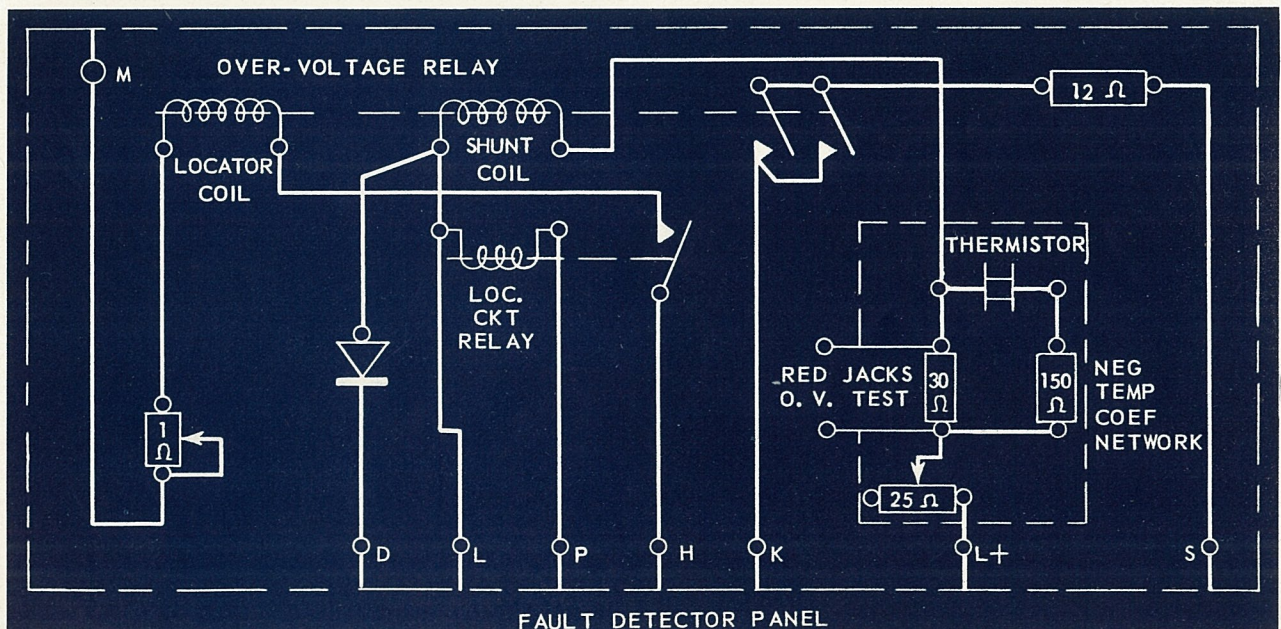
Detection and removal of this type fault is accomplished as follows:

Under all conditions of positive generator current, the ground bus has a positive potential with respect to the generator "D" terminal. This potential causes current to flow through the rectifier in the fault detector panel and through the balance coil in the circuit breaker to the "Z" junction. The ampere-turns produced by the balance coil tend to trip the circuit breaker and, under a feeder fault condition, the breaker is tripped by this means. However, during normal operation, the generator feeds the bus through a series coil in the circuit breaker. The ampere-turns produced by this coil oppose those produced by the balance coil and no circuit breaker trip is effected. Upon application of a feeder fault, the series coil produces no opposing ampere-turns, and may assist the balance coil in effecting a circuit breaker trip. Under load conditions, the balance coil is affected by the total generator output while the series coil is affected by only that current supplied to or from the bus. The resultant ampere-turns is enough to trip the breaker if the fault current magnitude is approximately 300 amperes.

C. HEAVY REVERSE CURRENT.

In the event of malfunction of the reverse current relay or a condition which would cause the line contactor to weld closed, the "dead" generator would be severely damaged and its low resistance path to ground would seriously lower bus voltage if it were not removed from the bus. Protection from such a fault condition is afforded in this system by the same circuit which protects against ground faults.

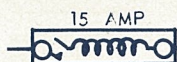
In reverse current protection, the rectifier in the balance coil circuit is used to drop the entire



"Z-to-ground" voltage, making the balance coil unable to oppose the series coil. The current through the series coil produces a magneto-motive force which will trip the breaker on current values of approximately 300 amperes. The dropping action of the rectifier is instigated by the reversal of the "Z-to-ground" voltage under reverse current conditions.

Essentially, this type of reverse current sensing is "back-up," or secondary, reverse current protection.

The two units discussed in the foregoing para-



SPECIAL CALIBRATED FIELD CIRCUIT BREAKER

In order to determine the functional ability of the field circuit breaker, several tests were made in which the field circuit was faulted to ground. The first of these faults was applied to the carbon stack side of the field breaker. This is essentially a generator feeder fault and would be expected to draw a high current through the breaker. Oscillographic recordings made during the application of this fault show that the breaker opens the generator field circuit approximately 10 milliseconds after fault application and that the generator is removed from the bus 49 milliseconds later due to reverse current. These time figures are for the condition of 6000 generator rpm, 150 amperes per generator initial load.

During a flight test, the lead from A+ on the generator became shorted to ground (possibly through some resistance). It is not known for certain whether the field breaker tripped, but the generator was incapable of output until the fault was removed; there was no apparent damage.

graphs have undergone extensive tests that were controlled to simulate actual operating conditions and, under all conditions, were found to operate satisfactorily.

The breaker will trip in 10 to 20 milliseconds after its shunt trip coil is energized by closing of the overvoltage relay contacts. The rapidity of the breaker action has been attained with no sacrifice in its ability to withstand shock loads, vibration, and other abnormal conditions (excluding the fault conditions on which the breaker is designed to trip) without giving false trips.

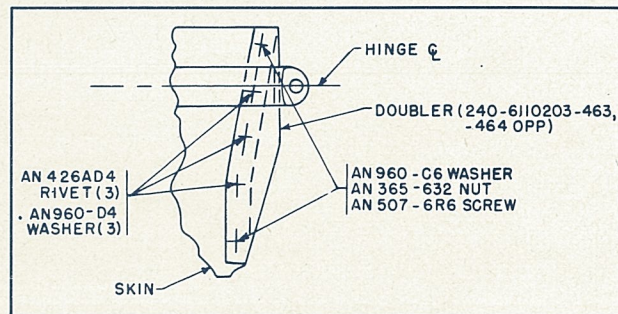
An almost similar fault was applied to the system under test (by shorting the generator A+ terminal to ground) with no breaker trip under various conditions of speed and initial load. This may be explained by considering the resistance in the path from B+ on the generator, through the field breaker and the carbon pile to the A+ terminal, and thence to ground through the fault. The addition of this fault current to the current normally flowing through the field breaker is not enough to cause the breaker to trip. The generator field collapses, however, and the generator is removed from the bus by reverse current action on the line contactor.

The breaker will not trip if the fault (A+ to ground) is applied before the generator is up to speed, for it will not build up, and the current drawn through the breaker will be too low to cause it to trip. No nuisance trips of these breakers were encountered during test runs and, under no conditions, did the breakers trip on normal field current.

Engine Cowl Assembly REWORK

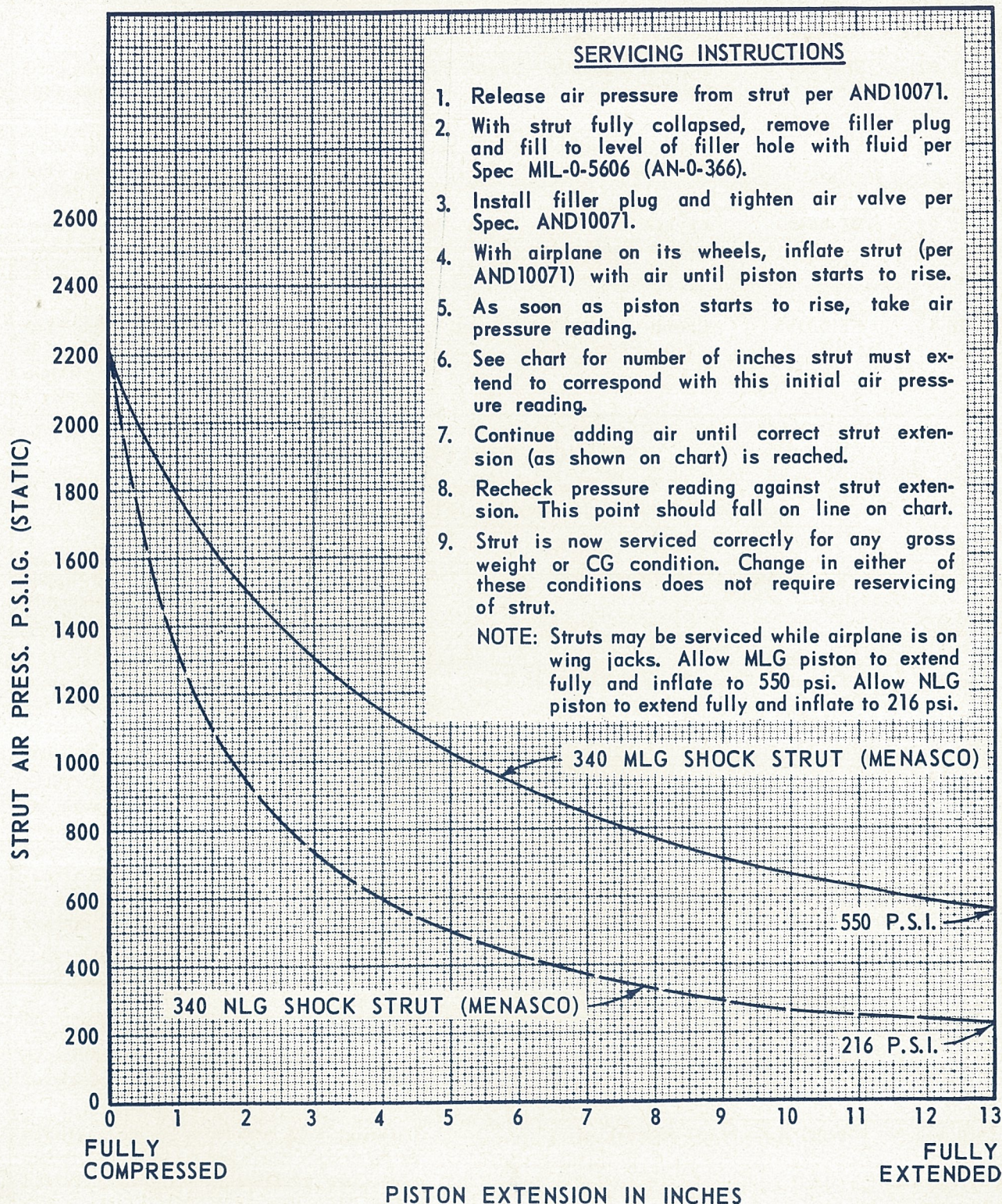
CONVAIR - LINER
240

In some cases, when attaching doublers (240-6110203-463 and -464) to the bottom cowl panels as described in the Convair TRAVELER, Volume III, issue No. 5, page 60, interference with the hinge has been experienced. To provide sufficient clearance, it is recommended that rivets be used in lieu of screws in the area of the hinge, and that in the two places where screws are used that the attachment be revised as follows: replace AN507-6R5 screws with AN507-6R6; and use only one washer under the screw head instead of two.



Illustrated is the recommended method of attachment.

Strut Pressure vs Piston Extension



SERVICE EQUIPMENT BULLETINS

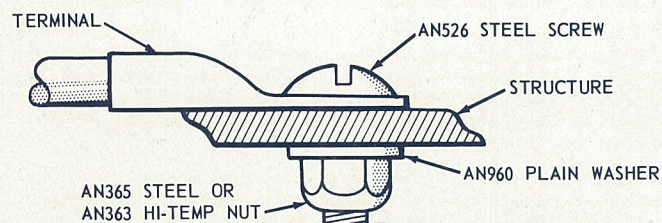
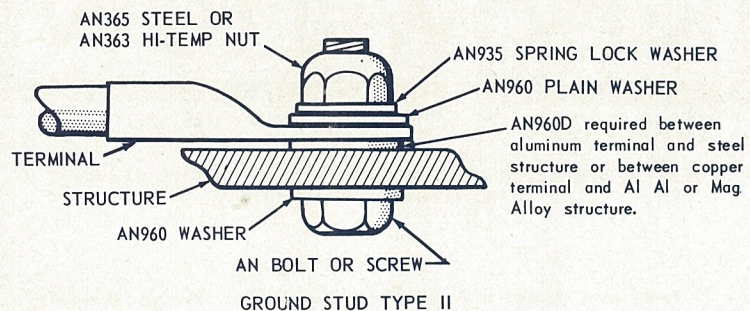
The following Service Equipment Bulletins
were issued between January 15, 1952 and June 15, 1952.

BULLETIN NUMBER	TOOL NUMBER	TITLE	PURPOSE
SE-22	SE-0541	Support Assembly—Engine Top Cowl Panel	To hold top cowl panel in open position. (For use on Convair-Liner 340s only.)
SE-28	SE-0133	Shackle Assembly—Tail Post Mooring	To facilitate attaching tail mooring line by providing tie-down loop. (For use on Convair-Liner 240s and 340s.)
SE-29	ST-00433	Keyhole Fastener—Water In- jection Tank	To facilitate service handling, removal, and installation of water injection tank. (For use on Convair-Liner 240s and 340s.)
SE-30	ST-00355	Clamp—MLG Shock Strut	To secure inner cylinder of MLG strut in static position while airplane is being jacked for service or inspection. (For use on Convair-Liner 340s only.)

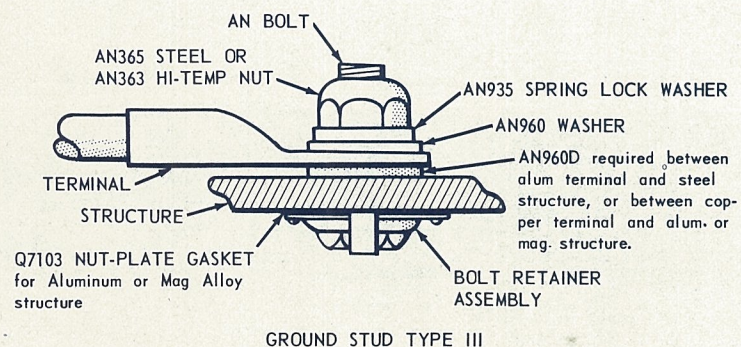
SERVICE BULLETINS

The following Service Bulletins
were issued between January 15, 1952 and June 15, 1952.

NUMBER	TITLE	REASON FOR CHANGE
240-416	Engine Mount—Modification of	To replace upper left-hand and upper right-hand tubes in engine mount assembly with heavier walled tubes of same outside diameter.
240-418	Propeller Control—Installation of Time Delay Relay	To provide Airite 5012 actuator in place of existing actuator, Airite 5011. Change includes substitution of electrical delay feature in place of hydraulic delay feature.
240-425	Stainless Steel Cowl Panel Parts for Pow- er Plant—Addition of	To improve fire barriers in nacelle area forward of fire wall by installation of stainless steel facings over certain aluminum alloy components of engine cowl panels, oil cooler duct, and nacelle structure; and by installing rubbing strips on top and bottom cowl panels to improve service life of these panels.
240-428	Inspection and Rework of Main En- trance Door Latch Hook	To provide rework of main entrance door latch hook.
240-429	New Passenger Window Glass—Require- ments for	To define inspection standards for passenger compartment window assemblies in order to obviate needless return of deviated glass.
240-433	NLG Axle Nut—Rework of	Describes field rework to be accomplished on NLG axle nut (240-5210006-8), when nuts show evidence of insufficient thread relief.

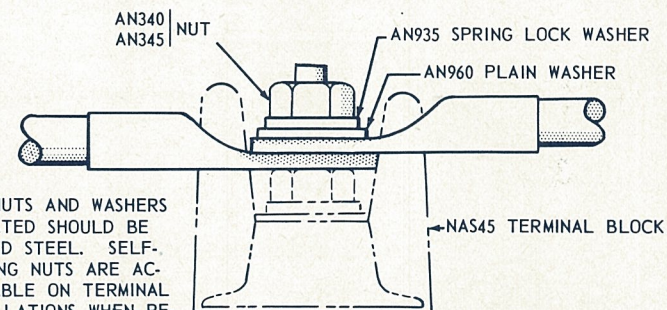


OPTIONAL TYPE II ATTACHMENT WHERE BOTH STRUCTURE AND TERMINAL ARE OF LIKE MATERIALS

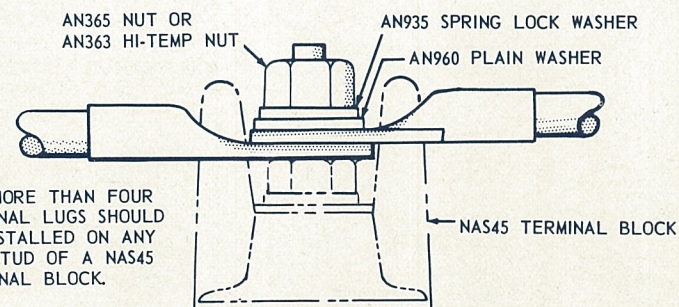


Know-How

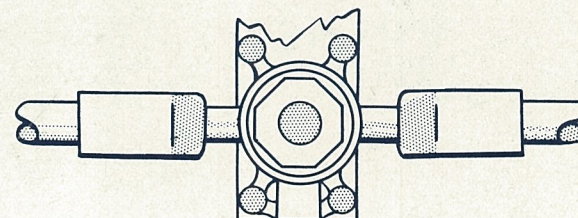
INSTALLATION OF TERMINALS ON TERMINAL BLOCK



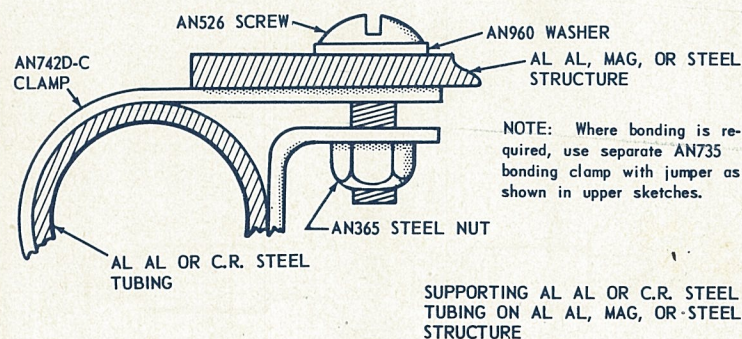
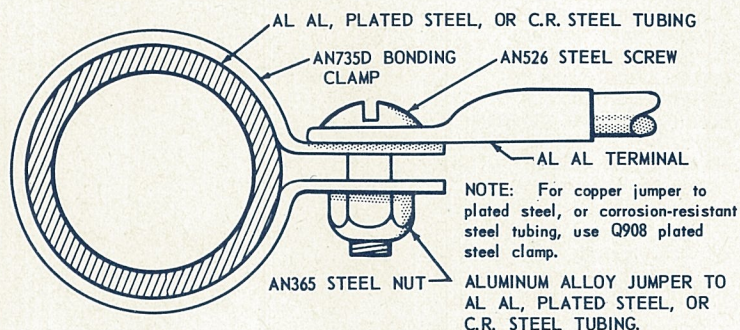
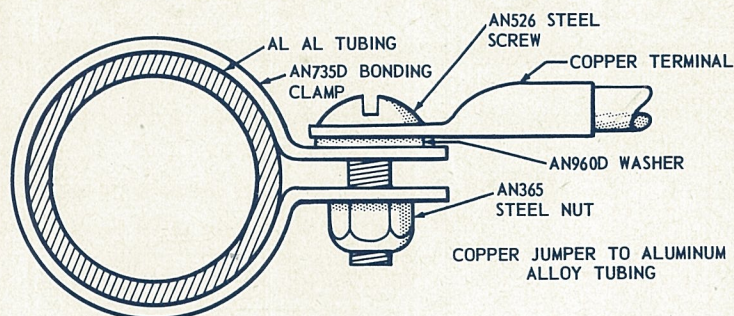
ALL NUTS AND WASHERS INDICATED SHOULD BE PLATED STEEL. SELF-LOCKING NUTS ARE ACCEPTABLE ON TERMINAL INSTALLATIONS WHEN RECEIVED AS A PART OF PURCHASED PARTS OR OTHER EQUIPMENT. ALL OTHER TERMINAL INSTALLATIONS SHOULD BE MADE WITH ALL-METAL NUTS.



NOT MORE THAN FOUR TERMINAL LUGS SHOULD BE INSTALLED ON ANY ONE STUD OF A NAS45 TERMINAL BLOCK.



INSTALLATION OF GROUND STUDS, BONDING CLAMPS, AND BONDING SUPPORT CLAMPS



Know-How

INSTALLATION OF BONDING OR GROUND STUDS, BONDING CLAMPS AND BONDING SUPPORT CLAMPS

To assure good electrical contact, all contacting surfaces should be thoroughly cleaned prior to assembly.

Abrasives used to remove paint, anodic films, or other non-conductive finishes should be limited to No. 7/0 garnet finishing sandpaper, or equivalent.

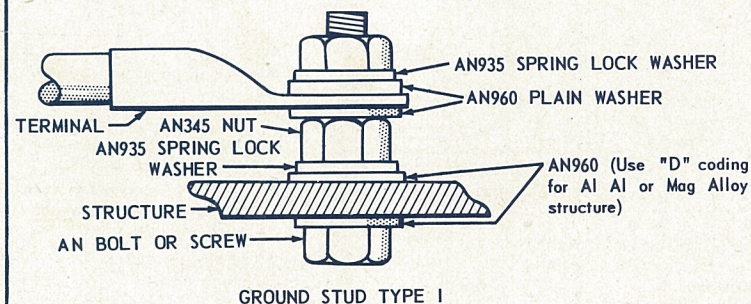
Attachment to aluminum alloy structure should receive one coat of zinc chromate primer and one coat of aluminized spar varnish as soon as practicable after assembly.

Polished contact areas on magnesium alloy should be given a one-minute brushing of chrome-pickle solution followed with a brushing rinse of water, and then thoroughly dried, immediately prior to assembly. Immediately after assembly, the bond connection should receive one coat of zinc chromate primer and one coat of aluminized spar varnish.

Attachment to plated steel and/or corrosion-resistant steel structure will require no treatment other than cleaning of contact areas and replacement of disturbed finish. Due care should be exercised in the cleaning process to prevent complete removal of plating.

Self-locking nuts with fiber inserts should not be used for attachment of terminals to ground studs.

AN315 or AN345 nut assemblies already fabricated with locknuts are approved for use.



ANX
34

Convair

TRAVELER

FLAPS

Fowler Flap

CONSOLIDATED VULTEE

AIRCRAFT CORPORATION

SAN DIEGO CALIFORNIA

SEPTEMBER 1952
VOLUME IV
NUMBER 5

EARLY SOLUTIONS

TELESCOPING

WING

VARIABLE INCIDENCE

VARIABLE CAMBER

$V.D. = \frac{4(0.57)}{4(0.12)}$

$1 = \frac{2\%}{10\%}$

AN airplane with a small wing area cruises fast and takes off and lands at high speeds. An airplane with a large wing area can take off and land at low speeds, but it also cruises at low speeds. A combination of the two . . . high cruising speeds and low landing and take-off speeds . . . of course, is the ideal combination.

Unlike power, angle of attack, or payload, the wing area cannot vary, unless some method is used for increasing the size of the wing.

A telescoping outer panel that provided a variable area wing was considered, as was a wing that could change the camber when going from high to low speeds. At the time, none of these seemed practical since the gain from each did not justify the

Unlike power, angle of attack, or payload, the wing area cannot vary, unless some method is used for increasing the size of the wing.

A telescoping outer panel that provided a variable area wing was considered, as was a wing that could change the camber when going from high to low speeds. At the time, none of these seemed practical since the gain from each did not justify the added weight and complexity of the installation.

It was apparent that a simpler method was needed and . . .

This issue of the **TRAVELER** deviates from the established pattern to present a pictorial guide to a better understanding of wing flaps and their use, and should be of interest to all concerned.

The important rules for proper flap management are pinpointed to avoid misunderstanding in the use of the wing flap. While these rules are applicable to all aircraft equipped with wing flaps, the specific tables and charts found in the flight manuals of all aircraft remain the guiding factor.

The *Convair* TRAVELER Copyright 1952
Consolidated Vultee Aircraft Corp.
San Diego, California September 1952

A digest of Convair-Liner operation and service published monthly by the Service Publications Section of Convair in the interest of Convair-Liner operators and for the promotion of sales and service. Communications should be addressed to Chief of Service, Convair, San Diego 12, California.

F. W. Fink, *Chief Engineer* J. J. Alkazin, *Chief of Service*
G. S. Hunter, *Editor*

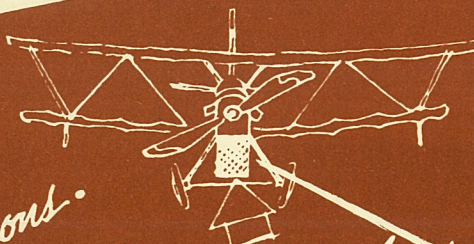
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VOLUME IV

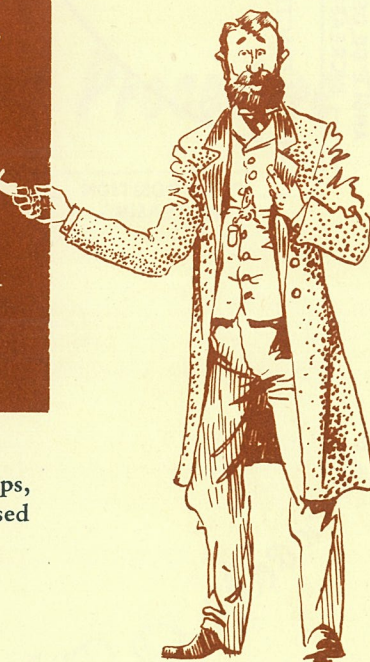
Number 5

THEN came FLAPS

A hinged portion of the trailing edge of the wing offered one of the early workable solutions.



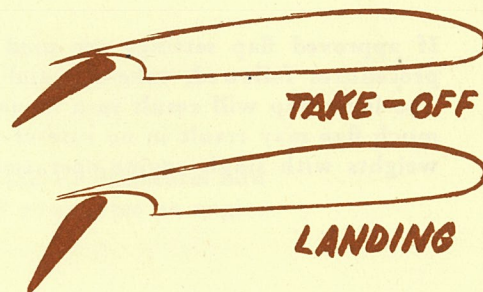
One of the earliest flaps hung from the belly and first created drag.



They were simple installations and, being strictly drag flaps, increased the landing angle of descent only. They were not used for take-off.

The high performance of present day commercial and military aircraft has depended to a large extent on the use of high wing loadings. This in turn has resulted in high take-off and landing speeds. To overcome the characteristic of high take-off and landing speeds, various devices were tried before the trailing edge wing flap was selected as the most suitable for decreasing the take-off and landing speeds without impairing the cruise performance.

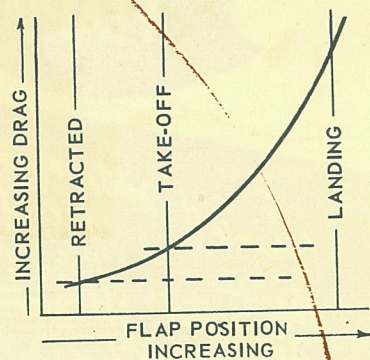
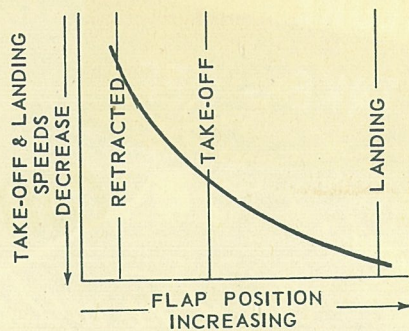
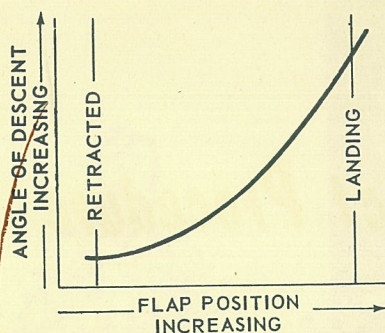
The Convair Fowler flap installed at the wing trailing edge moves backwards and rotates down when deflected. This action realizes the benefit of a slot at the flap leading edge and effectively increases the wing area and changes the camber.



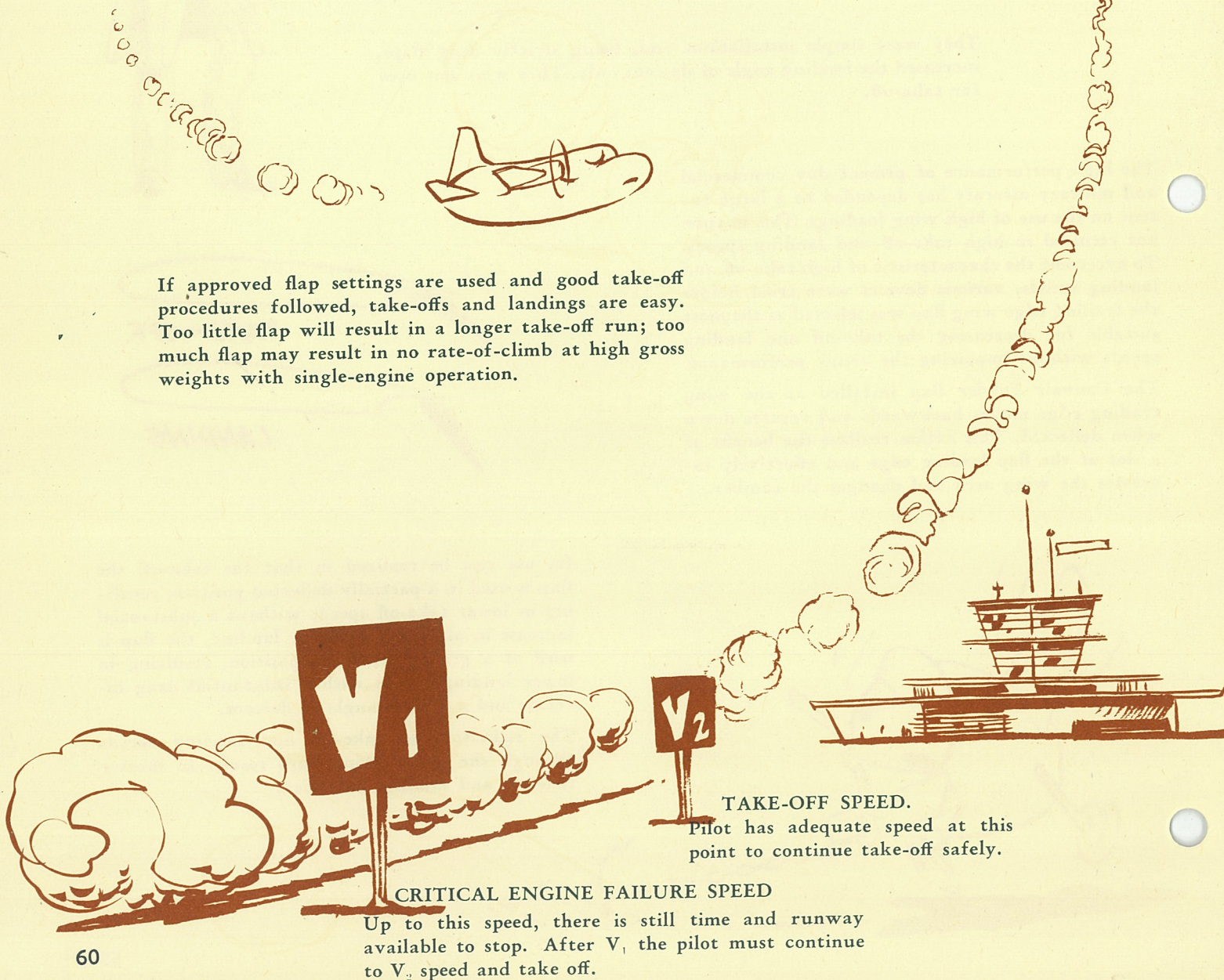
Its use can be realized in that for take-off the flap is used in a partially deflected position, resulting in lower take-off speeds without a substantial increase in airplane drag. For landing, the flap is used at a greater deflected position, resulting in lower landing speeds with a substantial drag increase and a steeper angle of descent.

The reduction in take-off and landing speeds through the use of wing flaps results in shorter take-off and landing distances.





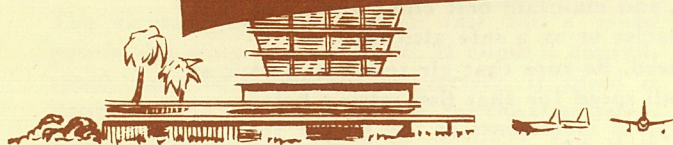
If approved flap settings are used and good take-off procedures followed, take-offs and landings are easy. Too little flap will result in a longer take-off run; too much flap may result in no rate-of-climb at high gross weights with single-engine operation.



PLUTTTT

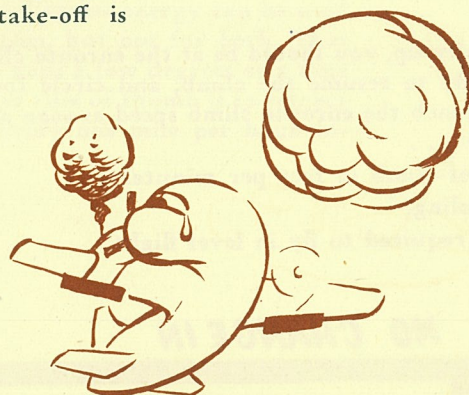


ENGINE
FAILURE
at TAKE - OFF



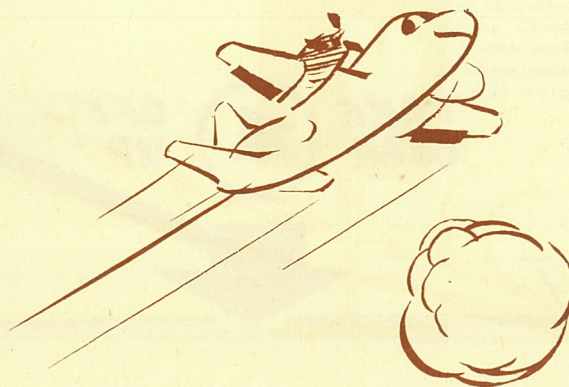
Correct Procedure

If approved flap settings are used and good take-off procedures followed, take-offs are easy, even after an engine failure. Proper flap management during one-engine take-off is especially important.



The chart on pages 62 and 63 illustrates how to make a safe take-off even after an engine failure.

The procedures are generalized to cover most aircraft with flaps. For detailed procedures, refer to applicable handbook of Flight Operating Instructions.





ENGINE FAILURE at TAKE-OFF

1. Raise landing gear immediately.
2. Hold take-off flap setting, and maintain best climb speed for that setting until clear of obstacles or at a safe altitude.
3. Level off to pick up air speed. Be sure that air speed is always at least 20 per cent above stall speed for that flap setting before retracting flaps. Retract flaps in increments as the proper speed is obtained, until flaps are fully retracted.

NOTE

DON'T RETRACT FLAPS fully at V_x speed since the result will be a **SERIOUS LOSS OF ALTITUDE**.

4. When flaps are fully up, you should be at the enroute climb speed. You are now ready to resume the climb, and circle for landing. It is desirable to reach the enroute climb speed as soon as possible, because you have . . .
 - a. Greatest rate-of-climb in feet per minute.
 - b. Best engine cooling.
 - c. Lowest power required to fly in level flight.

NO CHANGE IN



FLAP SETTING

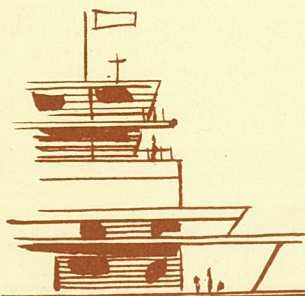
During this phase with minimum take-off climb speed, maximum rate-of-climb will be obtained with take-off flap setting. **DO NOT RETRACT THE FLAPS.**

**TAKE
GEAR**



**OFF
UP**

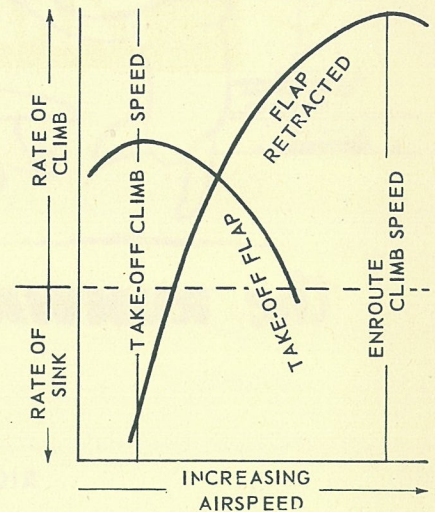
**ENGINE
FAILURE**



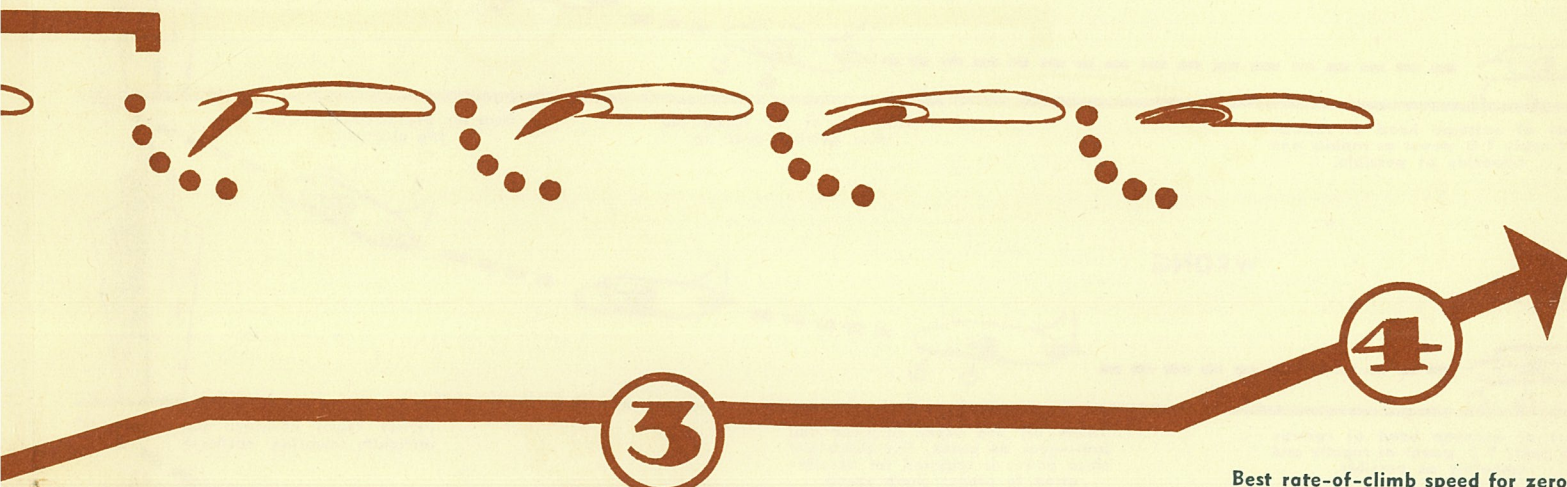
At low air speeds, flaps are depended upon to sustain flight. If flaps are retracted, the airplane may buffet and lose altitude. Before reaching air speed at which it is safe to retract flaps, a better rate-of-climb is obtained with flaps than without.

The airplane can go only so fast for a given power and wing flap condition. If climb is desired, speed must be sacrificed; conversely, if speed is desired, climb must be sacrificed, for the time being. Either speed or climb can be obtained, but it is not possible to have both. A substantial increase or decrease of the recommended climb speed will result in decreased rate-of-climb.

During period of flap retraction, rate-of-climb will be reduced because total excess energy can be used for climb or acceleration, but not for both. That is why, retracting the flaps a few degrees at a time is recommended. A good rule of thumb is to retract flaps one degree for every one mile per hour increase in air speed.

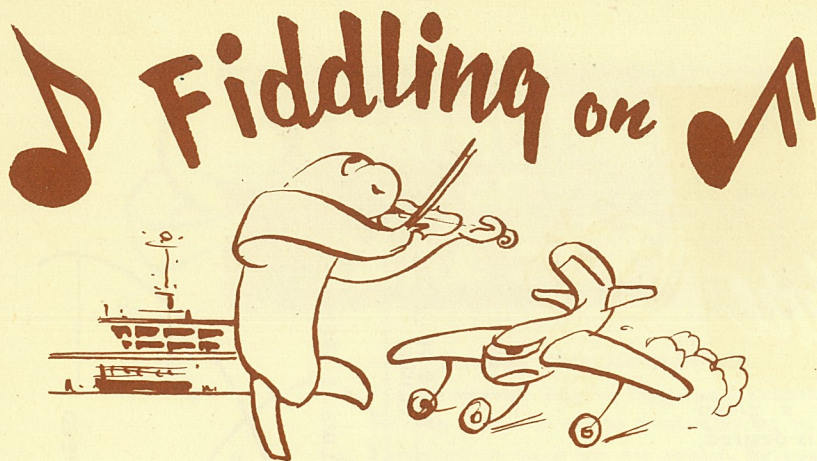


RETRACTING FLAPS AT TAKE-OFF CLIMB SPEED MAY RESULT IN SINK.



Flaps retracted in series of small increments for a related series of ever-increasing air speed. During this phase, a small change in air speed can have a large effect on rate-of-climb.

Best rate-of-climb speed for zero flap setting. Climb speed in flight manual has been worked out to give best rate-of-climb possible while maintaining a safe margin over buffet speed.



the RUNWAY

Take-off characteristics are based on approved procedures and fixed performance values.

Obstacles can be cleared adequately IF . . .

- Take-off is started at extreme head of runway.
- Take-off power is applied as rapidly and smoothly as possible.
- Take-off is accomplished at proper V_2 speed.
- Gear is retracted as quickly as possible after take-off.

It is important to retract the landing gear as quickly as possible after take-off as the gear is predominantly a drag item during flight, and rate-of-climb in some cases can be DOUBLED by retracting the landing gear.

RIGHT



Start at extreme head of runway and apply T.O. power as rapidly and smoothly as possible.

Take-off at V_2 speed.

Retract gear as quickly as possible after leaving runway.

Leave flaps in take-off position until obstacles are cleared.

Obstacle cleared adequately.

WRONG



Start at extreme head of runway and apply T.O. power as rapidly and smoothly as possible.

Take-off at V_2 speed but slow getting gear up.

Gear up, but difficulty clearing obstacle.

WRONG

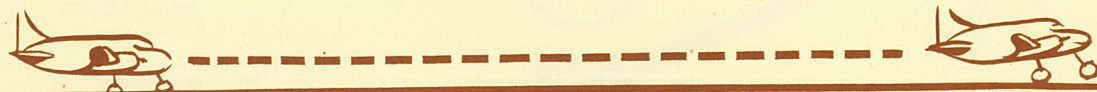


Start at extreme head of runway and apply T.O. power as rapidly and smoothly as possible.

Takes off too soon—airspeed too low—gear up quick, but climb low since power is required for acceleration to proper climb speed.

Proper speed obtained but difficulty clearing obstacle.

WRONG



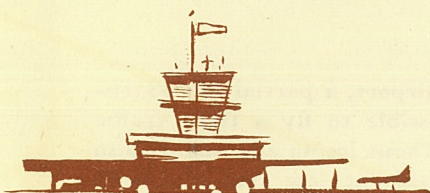
Start at extreme head of runway and apply T.O. power as rapidly and smoothly as possible.

Take-off too late — speed high — too much runway used.

Gear up quickly, but too near obstacle. Difficulty clearing obstacle.

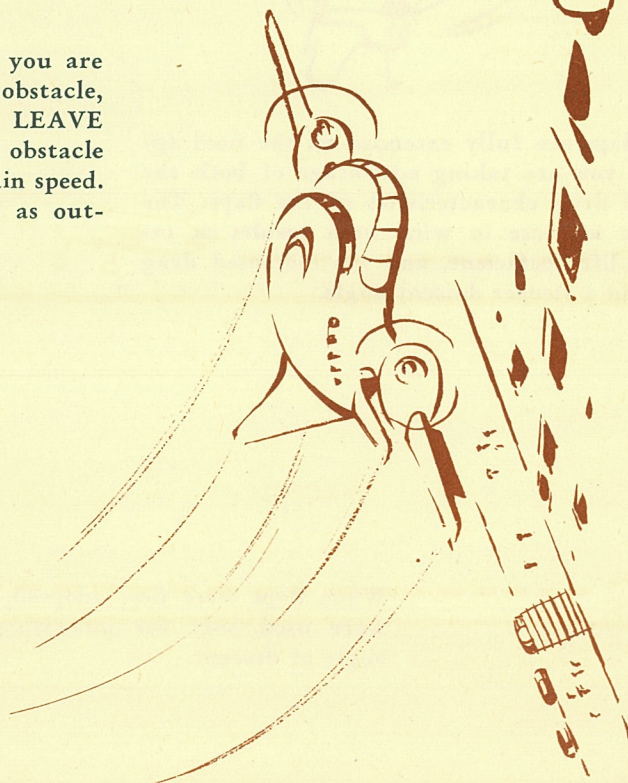


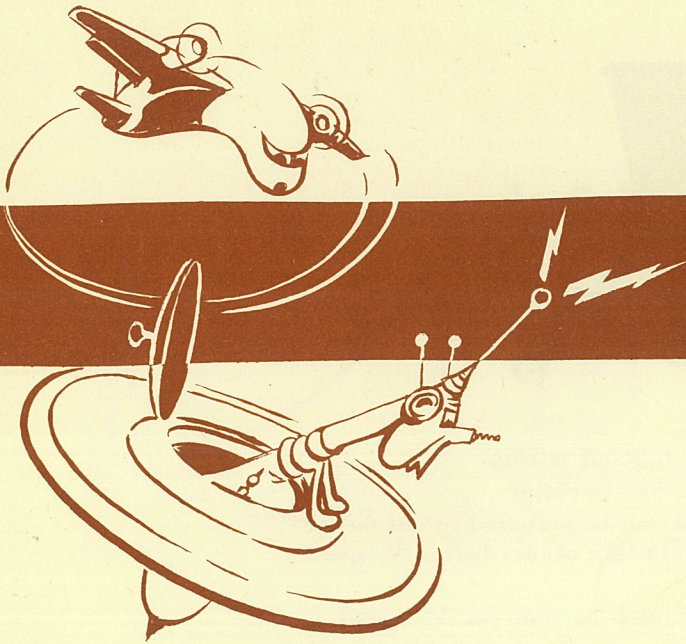
1. Set flaps at approved take-off setting.
2. Apply power rapidly, but smoothly.
3. Accelerate to V_1 speed and be prepared to cut power and stop, if an engine failure occurs before V_1 speed is reached.
4. Prepare to break ground as soon as V_2 speed is obtained.
5. Retract landing gear immediately after becoming safely airborne.
6. During normal take-off, flaps may be retracted in one continuous motion due to rapid airplane acceleration.



Pulling up to **CLEAR OBSTACLE**

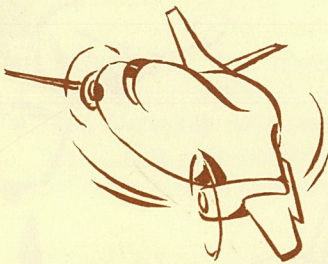
If a situation should arise where you are forced to pull up to clear an obstacle, resulting in decreased air speed, **LEAVE THE FLAPS DOWN**. After the obstacle is cleared, level off again and regain speed. Then retract flaps in increments as outlined on pages 62 and 63.





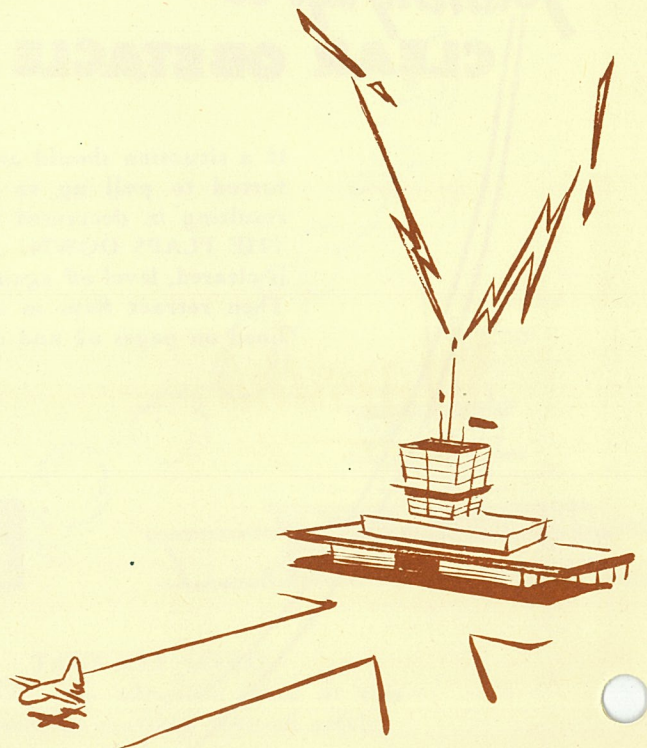
STACKED UP

When stacked over a busy airport, a partial flap extension (holding) makes it possible to fly a tight traffic pattern at reduced speed without losing altitude. It also makes an airplane more stable at low speeds. Lift is maintained in effective wing area to compensate for reduction of air speed.



When flaps are fully extended on the final approach, you are taking advantage of both the lift and drag characteristics of the flaps. The effective increase in wing area results in increased lift coefficient, and the increased drag results in a steeper descent angle.

When flaps were first adopted, they were used only for increasing the angle of descent.



**GO -
AROUND
(normal)**



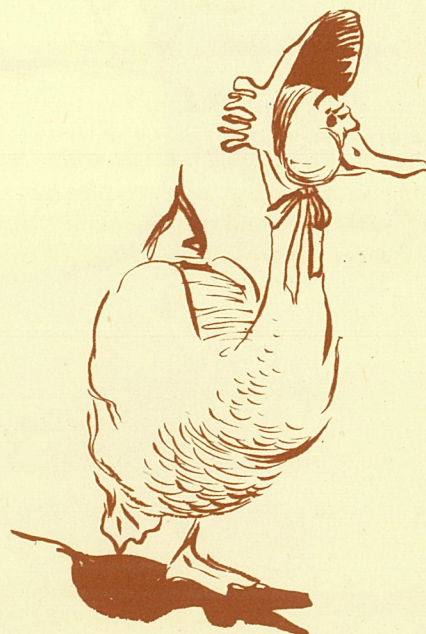
1. Apply take-off power.
2. Retract landing gear.
3. Pull up to best climb speed for a landing configuration.
4. Retract flaps to approved take-off setting and increase air speed to best climb speed for existing flap setting.
5. Proceed as on normal take-off, retracting flaps and maintaining best climb speed with flaps fully retracted.

This procedure is typical. It is of utmost importance that you see your flight manual for detailed instructions.

Warning

The most important general rules are:

- a. Determine the necessity for the go-around.
- b. Do it soon enough.





Convair TRAVELER

DECEMBER 1952
VOLUME IV
NUMBER 8



CONSOLIDATED VULTEE

AIRCRAFT CORPORATION

SAN DIEGO, CALIFORNIA

THE Convair TRAVELER

DECEMBER 1952

VOLUME IV

Number 8

Chief Engineer

F. W. Fink

Chief of Service

J. J. Alkazin

Editor

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FOREWORD

The illustrated approach used in this issue in discussing flight characteristics of the Convair 340 has been prompted by the enthusiastic reception of the September 1, 1952 Traveler "picture" presentation.

Included herein is a pictorial review of buffet and stall characteristics and airplane stability. Comments of readers of this publication are solicited.



ON THE COVER

Santa Claus has many modes of transportation throughout the world. He is shown here arriving by airplane . . . a Convair-Liner 340. The cover seemed particularly appropriate at this time of year . . . and the Convair-Liner particularly suited for Santa's capacity loaded interurban flights.

A bit early — but we do say Season's Greetings to all.

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The stall of any airplane may be defined (in terms of indicated airspeed) as that minimum flight speed obtained through the use of full up elevator; that minimum flight speed at which the airplane exhibits an uncontrollable nose-down pitch; or that minimum flight speed at which the lift created by the wings is less than the weight of the airplane and is accompanied by adequate stall warning. The latter two stall conditions will occur when the angle of attack, associated with the maximum lift coefficient for the particular airplane configuration, has been exceeded.

The stall of the Convair 340 is considered excellent whether accomplished with power off or power on. Lateral and directional control are adequate throughout the stall to counteract any rolling tendency. The stall can be completed and recovery accomplished without other than normal piloting skill.

Since it is not expected that full stall will be encountered during normal operation, the discus-

sion will be confined primarily to the pre-stall warning. Acquaintance with the pre-stall warning of the Convair 340, so as to preclude the possibility of encountering a full stall, is therefore desirable.

The pre-stall warning is primarily evidenced by moderate airplane and control system buffet, or shake, and secondly by a change in elevator control characteristics. The changes in elevator control characteristics at the onset of the pre-stall buffet are such that considerable elevator position and force changes are necessary for completion of the stall. Airplane buffet is, therefore, the best indication of proximity to the stall since this type of buffeting is not experienced at any other time.

Mild buffeting, which may be mistaken for the pre-stall warning buffet, can be induced through inadvertent opening of the cowl doors to extreme positions, but, since normal flight operations do not require these cowl door positions, such conditions will not normally be encountered.



Pre-stall buffet speeds, as do stall speeds, occur at a certain angle of attack and corresponding coefficient of lift. This is a desirable condition, since its relationship to the full stall will always provide an adequate warning and will guard against inadvertent stalling of the airplane. Pre-stall buffet speed with wing flaps retracted occurs at a speed approximately 7 per cent above the stall; with wing flaps extended to a 40-degree position, the pre-stall buffet speed occurs at a speed approximately 4 per cent above the stall.



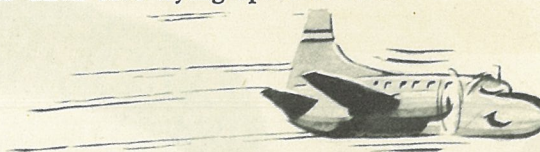
In all cases after buffet has been encountered, considerable elevator position and force changes are required to further decrease airspeed; therefore, in instances where the buffet speed occurs close to the full stall, it is considered an adequate warning, because any further reduction of airspeed will be obtained only through deliberate action of the pilot.

HIGH ALTITUDE

Whenever buffet has been unintentionally encountered, two methods of recovery are recommended.

ENCOUNTER

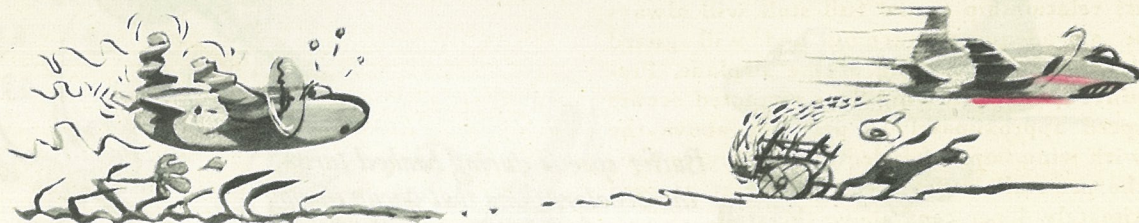
If buffet is unintentionally encountered while flying at an adequate cruise altitude, speed should be recovered by increasing power or by decreasing airplane attitude until safe flying speed is established.



Minimum recommended flying speed for any wing flap configuration is at least 20 per cent above stall speed.



LOW ALTITUDE ENCOUNTER



If buffet is unintentionally encountered during low altitude flight, a small extension of the wing flaps and an application of power will usually eliminate buffet. After buffet has been eliminated, wing flaps may be retracted in increments as speed is increased. Speed may be increased during level flight through a further application of power. At least 20 per cent above the stall speed should be maintained for any wing flap configuration.

Extension of landing gear on the Convair 340 reduces the speed at which buffet will be encountered. The effect is most pronounced with wing flaps retracted, and diminishes as flaps are extended to the point where no effect is noticed at the fully-extended flap position. With wing flaps retracted, buffet speed is reduced 6 to 7 mph when the landing gear is extended. The same effect is noted in actual stall speed, so that the buffet margin is not adversely affected.

All buffet speeds are quoted on the basis of occurring at the referenced speed when the rate of airspeed deceleration is 1 mph/second. This rate of deceleration obviates the possibility of noticeably exceeding normal airplane acceleration of 1 g.

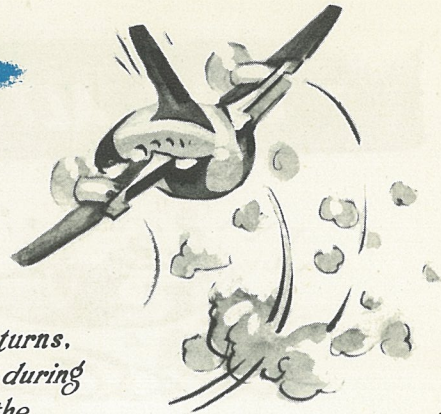
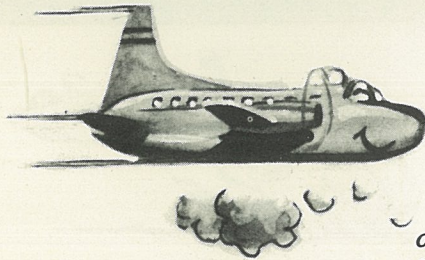
If the airplane is subjected to a noticeably higher-than-1-g acceleration (such as would occur with abrupt elevator control movement during normal take-off, climb, cruise, or landing, or in coordinated banked turns) buffet will be induced at higher than normal buffet speeds.

This effect results from the apparent increase in airplane gross weight as the acceleration is increased. For example: if the airplane were to experience a 2-g acceleration, such as would be encountered during coordinated 60-degree banked turns, the gross weight would effectively be doubled.

The wing produces lift to offset the weight at all times during normal flight operation, and a certain minimum speed (stall speed, usually) is required before sufficient lift is available to offset the weight of the airplane. Also, as the weight is increased, the minimum speed at which the lift is equal to the weight is also increased; therefore, the increase of buffet speeds, as noted during banked turns or abrupt aircraft accelerations, is primarily a result of an apparent increase in airplane gross weight.



BUFFET SPEEDS



Buffet speeds during banked turns, or the accelerations that occur during banked turns, will increase by the following values:

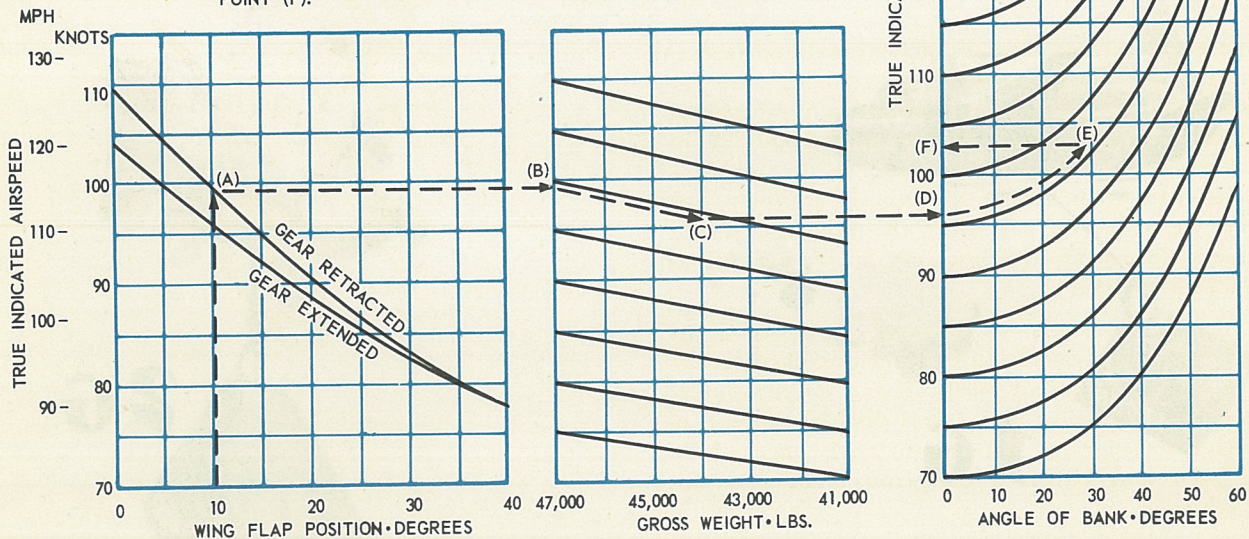
ANGLE OF BANK	ACCELERATION	% INCREASE IN NORMAL BUFFET SPEED
0°	1.0 g	0
15°	1.036 g	1.6
30°	1.155 g	7.3
45°	1.415 g	19.0
60°	2.0 g	41.4

It can be seen from this tabulation that airplane accelerations of 1.5 g's or more will result in buffet being induced at relatively high speeds.

CV340 PRE-STALL BUFFET SPEEDS — WITH ZERO THRUST POWER AND C.G. = 19% MAC. PRODUCTION AIRCRAFT ARE ACCEPTABLE IF WITHIN 5% OF THESE VALUES WITH ZERO THRUST POWER OR POWER OFF.

EXAMPLE: FIND BUFFET SPEED FOR 44,000 LBS WITH 10° FLAP, GEAR UP, & 30° BANKED TURN.

ENTER CHART AT 10° FLAP POSITION, AND PROJECT VERTICALLY TO INTERSECT BASIC CURVE AT POINT (A); THIS IS BUFFET SPEED FOR 47,000#. TO FIND BUFFET SPEED FOR 44,000#, MOVE HORIZONTALLY TO POINT (B), AND FOLLOW PARALLEL TO NOMOGRAM LINES TO G.W. = 44,000# • POINT (C); THIS IS BUFFET SPEED FOR 44,000# AND WINGS LEVEL. TO FIND BUFFET SPEED FOR 30° BANK, MOVE HORIZONTALLY TO POINT (F), AND FOLLOW PARALLEL TO NOMOGRAM LINES TO POINT (E), AND READ 103 KNOTS AT POINT (E).





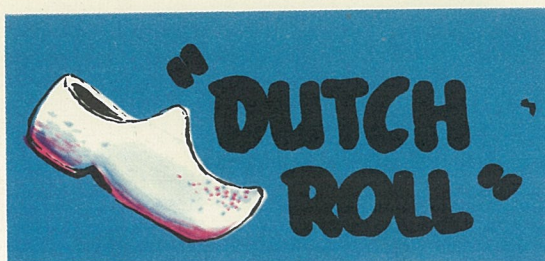
AIRPLANE STABILITY

Airplane stability is considered in terms of lateral stability, directional stability, and longitudinal stability. The degree of stability is an important factor in the ready acceptance of the airplane by the pilots.

In the design of aircraft, directional and lateral stability are closely interrelated such that an excessive stability of one system and a weakness of the other system may result in undesirable flight characteristics. As an example, if an airplane is designed with strong directional stability but very weak lateral stability, the airplane would exhibit a form of dynamic instability, defined as spiral instability.

Such an airplane, if deviated from its flight course to a yaw condition by some outside disturbance such as rough air, will roll and sideslip simultaneously, resulting in a spiral dive if allowed to continue. Generally, this condition is checked by the pilot long before a dangerous condition will be achieved.





Roll



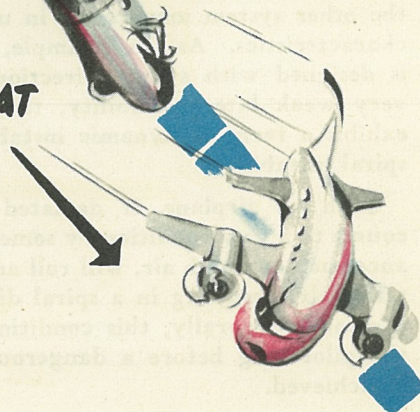
YAW



RECOVER



REPEAT



On the other hand, if an airplane is designed with strong lateral stability but very weak directional stability, it may evidence an undesirable and uncomfortable stable oscillation known as "Dutch Roll."

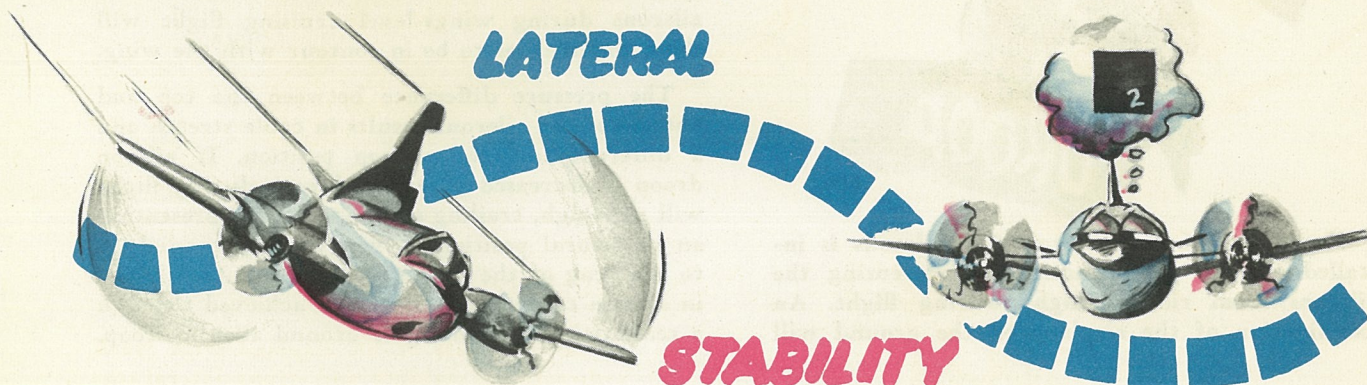
Such an airplane (if upset from normal flight by some outside disturbance such as rough air) would be characterized by a roll followed by a yaw, a stable return beyond the original flight position in a yaw and roll, and would continue until damped or checked by the pilot.

In the design of an airplane, it is desirable to proportion the amount of lateral and directional stability and, since the "Dutch Roll" characteristics are undesirable, the airplane is generally designed with a tendency towards the spiral instability condition.

In the operation of multi-engine aircraft, the control during take-off following an engine failure is a primary concern for the safety of the airplane. The loss of any one engine will cause an unbalance of power and produce a tendency towards yaw.

In the case of an airplane with weak directional stability and strong lateral stability, the airplane will yaw excessively followed by roll, and will require considerable pilot effort to counteract the unbalanced power condition.

The design of the Convair 340 provides strong directional stability and a minimum of lateral stability which results in a minimum of pilot effort in controlling the airplane following an engine failure during take-off.



The Convair 340 was designed with the minimum of lateral stability which would permit satisfactory demonstration of the Civil Air Regulation lateral stability requirements.

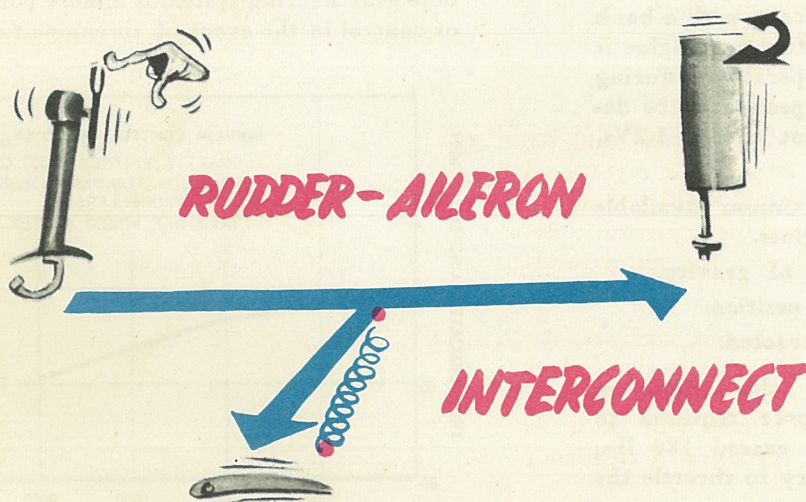
"CAR 4b.157—The static lateral stability, as shown by the tendency to raise the low wing in a sideslip, shall be positive (with all landing gear and flap positions and symmetrical power conditions) at all speeds from $1.2V_{s_1}$ to the maximum permissible speed."

The lateral stability demonstration for compliance with this regulation was adequate at all configurations tested except at the low-speed demonstration ($1.2V_{s_1}$) with 75% M.C. symmetrical

power, landing gear extended, wing flaps 40° , and a speed of 99 mph TIAS ($1.2V_{s_1}$). The lateral stability in this condition was marginal and necessitated the installation of rudder-aileron interconnect springs to achieve the required stability.

Installation of the rudder-aileron interconnect springs allows the airplane to comply with the Civil Air Regulations and yet retain the desirable control characteristics during unbalanced power flight.

Another desirable feature of the combination of strong directional stability and the minimum of lateral stability in conjunction with the rudder-aileron interconnect springs is the ability to conduct normal coordinated turns through the use of ailerons alone.





The droop of the Convair 340 ailerons is installed for the sole function of preventing the ailerons from riding "high" during flight. An examination of the airplane on the ground will

show that both ailerons are in a slightly *down* position when controls are in neutral. The droop of each aileron is 3° . Another examination of the ailerons during wings-level cruising flight will show the ailerons to be in contour with the wing.

The pressure difference between the top and bottom of the ailerons results in cable stretch and a different in-flight aileron position. If aileron droop is decreased to zero, ailerons during flight will ride high, trailing edge up; besides presenting an unnatural position, it will contribute slightly to the drag of the airplane. No noticeable change in aileron control forces will be achieved through a reduction of the 3-degree ground aileron droop.



DIRECTIONAL STABILITY

On multi-engine aircraft, directional control is usually associated with an unbalanced power operation such as a one-engine-inoperative flight condition. The concern in this case would be the minimum flight speed at which a straight course can be maintained. This is defined by the Civil Air Regulations as the minimum control speed.

"CAR 4b.133—Minimum Control Speed.

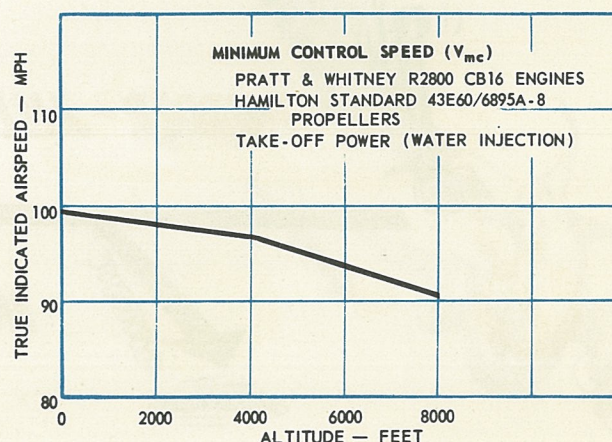
1. The minimum speed after recovery at which the airplane can be maintained in straight flight with zero yaw (or at the option of the applicant with a bank not in excess of 5°) after one engine is suddenly made inoperative during steady flight at that speed, shall be determined and shall not exceed $1.2V_{s1}$ with:

- Take-off or maximum available power in all engines.
- Rearmost center of gravity.
- Flaps in take-off position.
- Landing gear retracted.

2. In demonstrating this minimum speed, the rudder force required to maintain it shall not exceed 180 lbs, nor shall it be necessary to throttle the remaining engine."

The minimum control speed is directly affected by the power available on the operative engine. A decrease of power available will result in a lower minimum control speed, and an increase of power available will result in a higher minimum control speed. The minimum control speed of the Convair 340 is negligibly affected when the inoperative engine propeller is windmilling on the low-pitch stops instead of being feathered.

During normal take-off with both engines operating, and during landing, directional control by means of the rudder is available at speeds above 70 mph. It is not recommended, however, that directional control during take-off be entirely transferred from the nose gear steering system to the rudder at speeds above this value, because the nose gear steering system is a more positive method of control in the event of an engine failure.





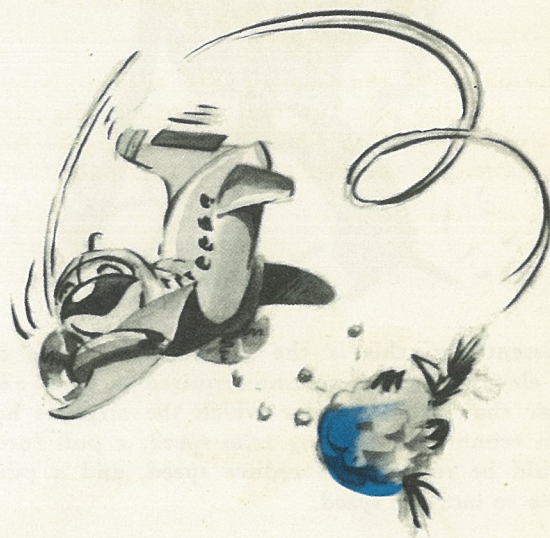
the stops have been reached, rudder motion is accomplished directly through the rudder control system. All normal flight rudder action, however, will be assisted by the flight tab resulting in relatively light rudder pedal forces.

The directional control of the Convair 340, as evidenced by the rudder pedal forces during normal take-offs, landings and flight maneuvers, is especially desirable. Unlike most large aircraft which require relatively high rudder pedal forces to achieve small changes in rudder angle, Convair 340 rudder pedal forces are relatively light and, as a result, changes in heading can be accomplished with ease and comfort.

The relatively light rudder pedal forces are achieved through installation of a rudder flight tab. Flight tab movement is directly controlled by the rudder control system through a spring torque tube.

Initial movement of the rudder pedals and control system produces a tendency to move the rudder in the desired direction. However, due to resistance of the airflow on the rudder, the pilot-applied force is transmitted to the spring tube, and flight tab motion in the opposite direction of the desired rudder motion produces the desired rudder motion.

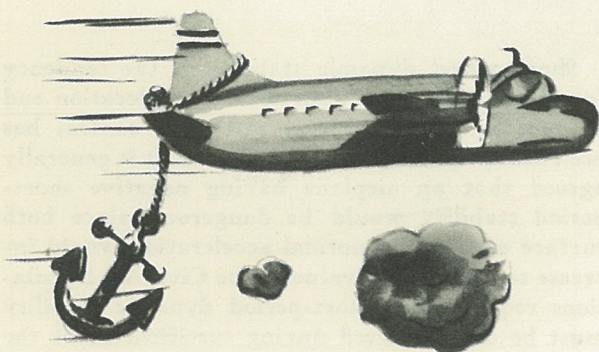
The spring tube flight tab system may be considered a "demand system" since more flight tab motion occurs at high airspeeds than at low. Flight tab assistance will be available until the spring torque tube stops have been encountered. After



Short-period dynamic directional stability, as evidenced by the tendency toward rapid and heavy damping of the rudder, is excellent. Rudder control surface motion, when abruptly deflected and released, is heavily damped, usually within one oscillation.

LONGITUDINAL

STABILITY



It is most desirable that the design of the airplane provide satisfactory longitudinal stability since its influence is encountered during almost all flight maneuvers. Therefore, in comparison to directional and lateral stability, it is considered the first and most important for safe flight and operation economics.

Along with being the most important, satisfactory longitudinal stability is also the most difficult to achieve since it is affected by a change in CG location, wing flap position, landing gear position, engine power, airplane speed, and elevator control system friction.

Following are several types of longitudinal stability that are of interest to the pilot, operator, and engineer.

STATIC STICK-FORCE STABILITY



Essentially, this is the pilot-applied force on the elevator control column required to fly at any other than the speed for which the airplane has been trimmed. From any trim speed, a pull force should be required to reduce speed, and a push force to increase speed.

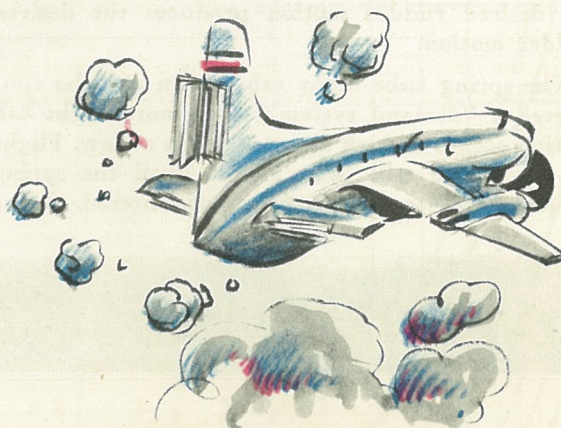


Static longitudinal stability increases as the airplane CG is moved forward, eventually resulting in control forces beyond which the pilot cannot readily control the airplane during landings. With a rearward movement of the airplane CG, static longitudinal stability deteriorates until small control forces produce a large change in airspeed, and control feel becomes poor. Civil Air Regulations define the permissible limits of static stick-force stability which must be demonstrated during certification tests of the airplane.

DYNAMIC STABILITY

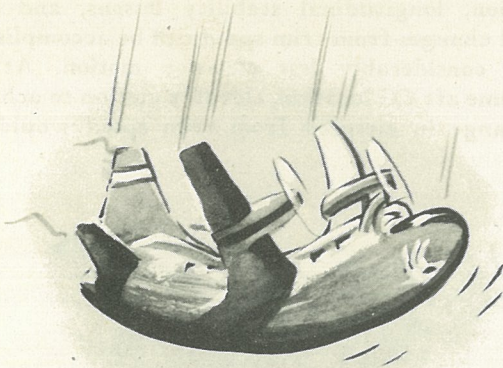


Long-period dynamic stability is the tendency of the airplane to return to stable flight at the trim conditions, after the airspeed has been substantially upset from trim by a pilot-applied longitudinal control force or by atmospheric disturbances. There is no longer a requirement for damping of long period dynamic stability by the Air Force, Navy, or CAA, although some pilots feel that an airplane should have positive long-period longitudinal stability.



Short-period dynamic stability is the tendency for rapid damping of both normal acceleration and of control surface motion after the control has been abruptly deflected and released. It is generally agreed that an airplane having negative short-period stability would be dangerous, since both surface motion and normal acceleration would increase to destructive values. The Civil Air Regulations require that short-period dynamic stability must be demonstrated during certification of the airplane to be heavily damped either with free or fixed control.

STICK FORCE PER "G"



It is considered important that the pilot should have to apply a considerable force to the elevator control in order to develop excessive airplane acceleration. Failure of airplane structure will result from excessive accelerations, and there should be no likelihood that the pilot can attain these excessively high accelerations inadvertently.

Adequate longitudinal stability is a major factor in establishing the permissible CG range for transport aircraft. The excellent longitudinal stability of the Convair 340 allows a wide variation of CG locations (8.5 to 35% MAC) which in turn permits the operator to accommodate all normal load variations without restricting passenger seating.



To provide excellent longitudinal stability, Convair Engineering has combined mechanical and aerodynamic systems to the best of their respective abilities. The trim and servo tabs, control column bobweight, and spring bungee are all interrelated so that the merits of one system avoid the limitations of the other.

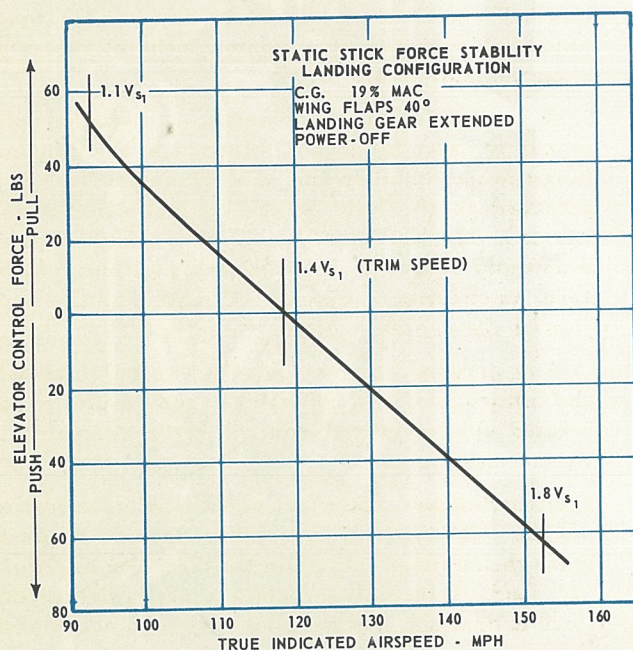
EXCESSIVE ACCELERATION

RESULTS IN STRUCTURAL

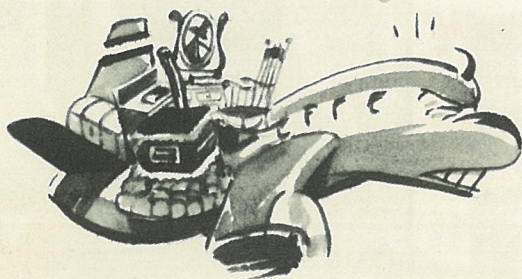
FAILURE



The longitudinal stability of any airplane increases as the CG is moved forward. Increased longitudinal stability results in the need for a greater elevator movement to achieve a change in airspeed from the trimmed condition. This need results in increased aerodynamic control forces and, at extreme forward CG locations, aerodynamic control forces become relatively high. A servo tab on the trailing edge of the left elevator, which moves in the opposite direction from the elevator, assists the pilot in overcoming a part of the relatively high control forces, such as might be encountered during landing.



The servo tab position is directly controlled by the elevator position and assists only with *up* elevator positions. Servo action of a lesser degree is also incorporated in the elevator trim tab for *up* elevator positions only. The servo action of the two elevator tabs reduces required pilot control forces to desirable values.

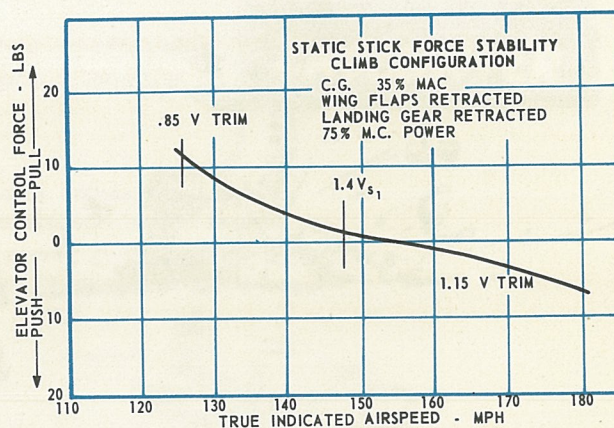


However, as the CG position is moved to an aft position, longitudinal stability lessens, and airspeed changes from trim speed can be accomplished with considerably less elevator motion. At an extreme aft CG location, elevator motion to achieve a change in airspeed from trim speed would be



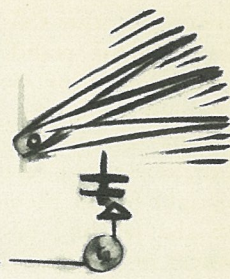
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slight, and the resultant aerodynamic control forces would also be slight. This would be an undesirable condition, because an inadvertent decrease of airspeed might be achieved without adequate changes in pilot control force to indicate that such a condition had been encountered.





The trim and servo tabs, control column bobweight, and spring bungee are all interrelated.....



To provide control forces of adequate value so that any decrease of airspeed from the trim speed is readily noticed through a substantial change in pilot control force, a spring bungee is installed which exerts a down elevator force at all elevator positions.

The influence of the spring bungee is realized through a difference in the aerodynamic elevator and trim tab hinge moments, as compared to the strength of the spring. For example: Assume that the trim tab is used to counteract the influence of the bungee in inducing full *down* elevator position. Then, since the trim tab force is directly affected by a change in airspeed from trim condition, a decrease of airspeed will result in less trim tab force, and it will be necessary for the pilot to apply a control column pull force to supplement the loss of trim tab force in opposing the spring bungee.

An increase in airspeed from the trim condition will increase trim tab force and in a sense will require a pilot push force to assist the spring in opposing the trim tab.

The effect of the spring bungee is also present during flight at an extreme forward CG, but its effect has been considered in the design. The spring bungee is installed with an overcenter action so that spring forces decrease at extreme *up* or *down*

elevator positions and therefore do not contribute appreciably to the aerodynamic control forces at these elevator positions.

A control column bobweight is installed primarily to exert favorable influence on the dynamic longitudinal stability and stick force per "g." It is attached to the base of the control column and exerts a push force on the column, which remains essentially constant at all column positions; therefore, its effectiveness is not influenced by the position of the control column.

Any induced acceleration ("g" force) increases the influence of the bobweight, and results in increased pilot-required control force to maintain the acceleration.

In turbulence, the effect of induced acceleration on the bobweight is noticeable since it tends to move the elevator column in the direction to reduce "g" load. It rapidly becomes a desirable feature since it does not require pilot action to accomplish the result.

The effects of power, wing flap, and landing gear have all been taken into consideration through the balancing of the mechanical and aerodynamic systems so that, during all combinations of power, flap, gear, and CG positions, adequate longitudinal stability is present throughout a greater CG range than would be possible with an aerodynamic system alone.



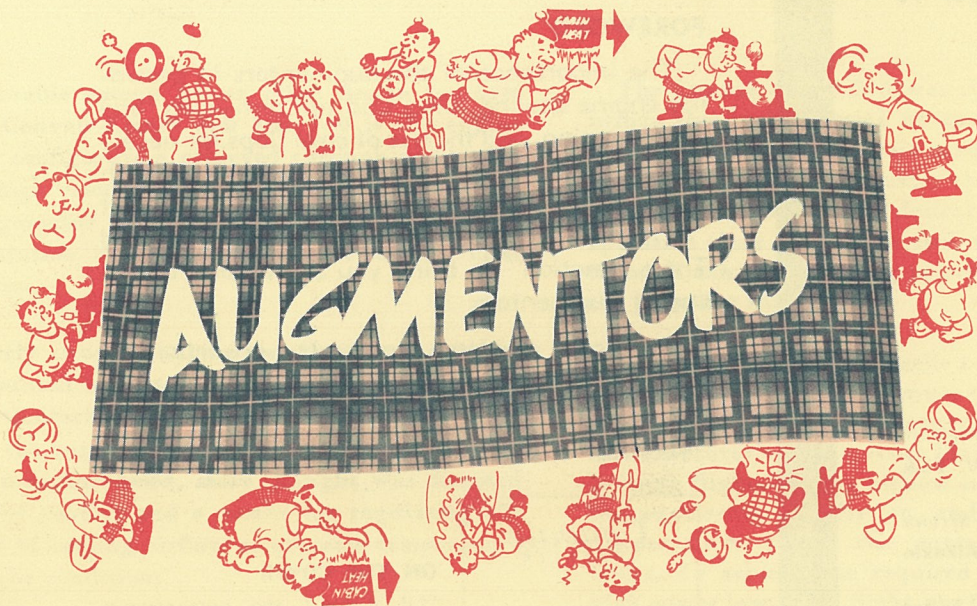
A COMBINATION OF MECHANICAL AND AERODYNAMIC CONTROL SYSTEMS ALLOWS A GREATER C.G. RANGE THAN WOULD BE POSSIBLE IN AN AERODYNAMIC SYSTEM ALONE!





Convair

TRAVELER



CONSOLIDATED VULTEE

AIRCRAFT CORPORATION

SAN DIEGO, CALIFORNIA

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FOREWORD

The importance of the augmentors in providing engine cooling, wing and tail anti-icing, and cabin heating, and the use of cowl flaps for necessary heat control are described in this issue with the help of "Lil Augie." He . . . at no extra cost . . . works his way through "Augmentors and Their Function" to bring you his version of the use of augmentors.

And, as a dividend, we present an article on the Curtiss-Wright Dehmel flight simulator. It, too, is illustrated by Dean Kennedy, creator of "Lil Augie."



ON THE COVER

"Lil Augie," the parsimonious Scot, created by Artist Dean Kennedy, portrays the economy of Convair's unique engine-nacelle design.

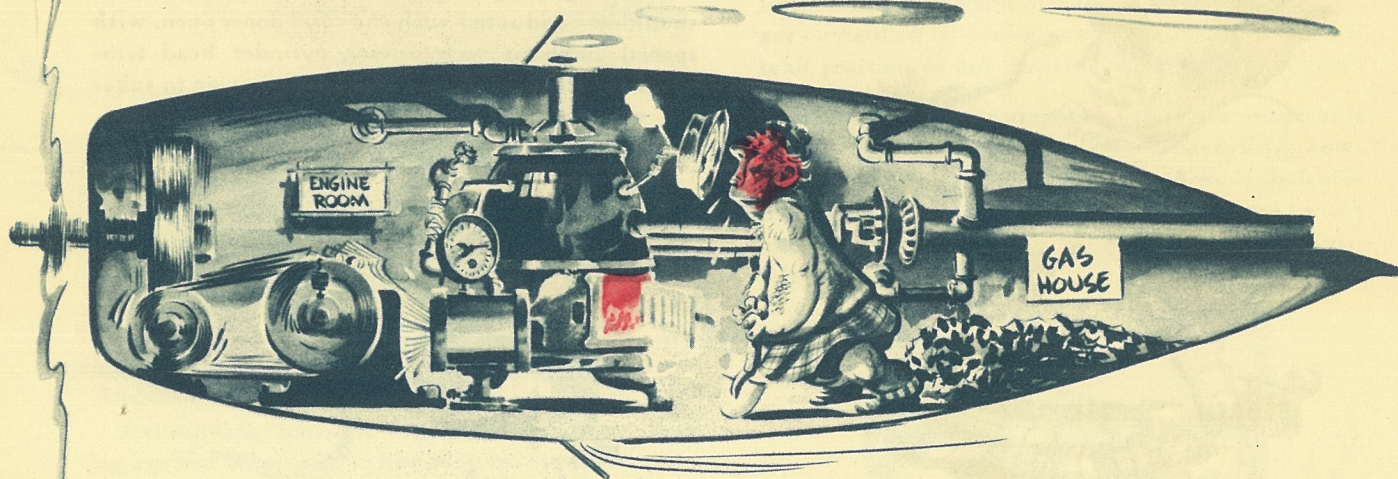
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AUGMENTORS

and their function



Noticeable among power plant design features in the Convair-Liners 240 and 340 is the engine cooling configuration achieved through utilization of the high velocity exhaust gases discharging into the augmentor tubes. This design is another in the evolution of the engine-nacelle cooling configuration.

In early aircooled engine installations, the engine was mounted in the airstream. Engine cooling was not particularly critical due to the low power output of the engines; however, as engine power and speeds were increased, more thought was directed to engine cooling and a means for regulating the amount of cooling airflow at extreme temperature and flight conditions.

The first step in this direction was obtained through the use of a ring cowl, which forced the airflow to pass around the cylinders instead of around the engine. The installation of a ring cowl improved engine cooling, but had two distinctive drawbacks: 1) overcooling during operation in extreme temperature conditions and, 2) unnecessary increased cooling airflow during cruise flight resulting in a loss of cruise speed. These were resolved through the installation of cowl flaps at the aft end of the engine cowl section. Operation of the cowl flaps from closed to various open positions allowed the pilot to regulate the engine temperatures to desired values and obtain faster cruise speeds.

The Convair-Liner 240 was the first airplane to utilize the high velocity of the exhaust gases to induce a flow of cooling air across the engine. The higher the power, the greater the pumping action. This design is especially desirable during ground operation since the engine cooling airflow induced through exhaust pumping action is independent of the propeller slipstream.

Basically, the engine-nacelle configuration is designed to provide the minimum cooling airflow for maintaining engine temperatures within the engine manufacturer's temperature limits. During normal cruising flight, cooling airflow is obtained through the augmentor installation, and results in engine temperatures below the engine manufacturer's limits. To achieve the required engine cooling at high power low-speed flight, the Convair 340 design incorporates four cowl doors to augment engine cooling airflow.

At take-off climb speeds or higher, sufficient ram airflow is available always to maintain a higher-than-ambient pressure behind the engine cylinders with the cowl doors open or closed. Therefore, if the cowl doors are opened during take-off or normal climb, the air will flow out of the doors and allow a greater airflow across the engine with resultant lower engine temperatures. It is also desirable during airline operation to maintain engine temperatures at values considerably below engine temperature limits for operational economy. During cruise flight, it may be necessary to open the cowl doors to achieve desired temperature values.



Introducing- 'LIL AUGIE

As stated earlier, induced cooling during ground operation is independent of the propeller slipstream, since the pumping action will always tend to reduce the pressure behind the cylinders, thereby inducing airflow across the cylinders. This is true whether the cowl doors are open or closed. The airflow created by the propellers induces negative pressure at the cowl door exit when the doors are open during ground operation. This, in turn, results in airflow from the engine compartment. Lower engine temperatures, therefore, can be obtained during ground operation with the cowl doors open.

Exhaust-augmentor pumping is substantially the same whether operating with forward or reverse pitch, but open cowl doors during reverse thrust operation are detrimental to engine cooling. With reverse thrust operation, airflow over the nacelle is in a forward direction, causing air to flow into the engine compartment and out through the augmentor tubes. This action reduces the airflow across the cylinders and produces higher engine operating temperatures. It is recommended, therefore, that the cowl doors be closed during reverse thrust operation.

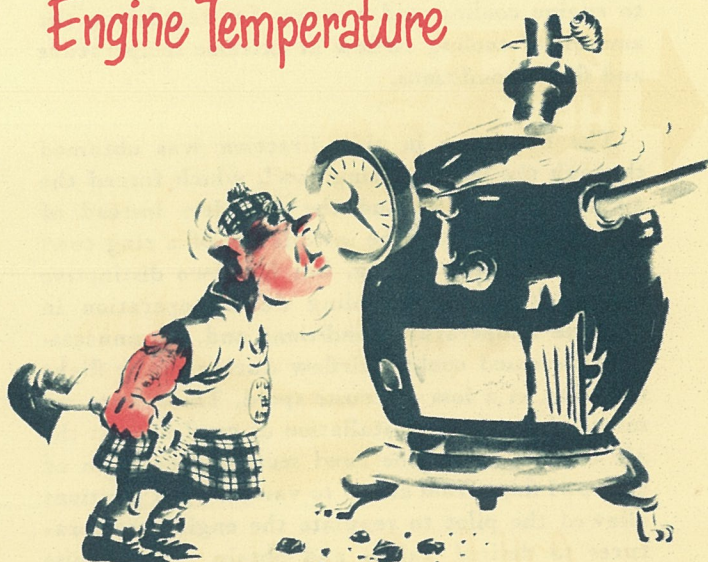
It is desirable during takeoff to maintain engine operating temperatures as low as practicable, since the power available at constant rpm and manifold pressure decreases substantially as engine temperatures increase. All ground operation, therefore, should be conducted with the cowl doors open, with special emphasis on reducing cylinder head temperatures to less than 150° to 170°C prior to takeoff, whenever possible.

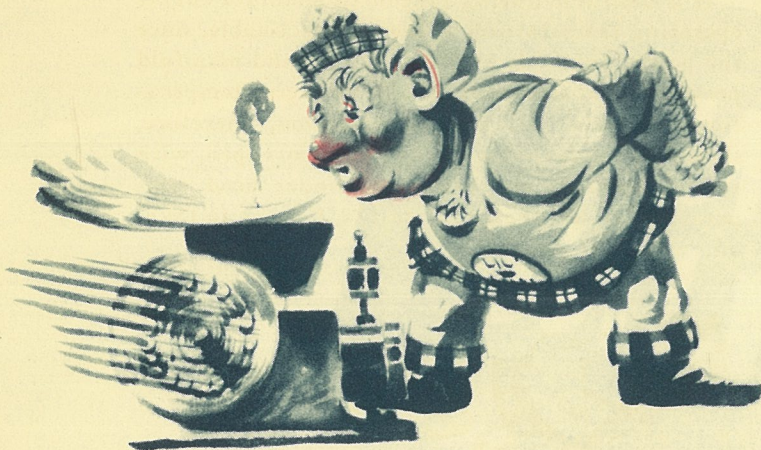


Providing Ram Air

To provide further engine cooling, it is desirable to use cowl doors in the partially open position for takeoff. When the top cowl doors are open 2 inches . . . the approved setting for takeoff . . . the bottom cowl doors will be less than 2 inches open. This operation is normal. The 2-inch top cowl door position for takeoff is the most efficient opening with regard to engine cooling and airplane performance.

Maintaining Desirable Engine Temperature





Reducing Cylinder Head Temperatures

Maintaining desirable engine temperatures during normal climb and cruise may necessitate a partial opening of the cowl doors. The use of extreme cowl door positions to maintain this temperature, however, may result in performance losses which may not compensate for the increase in engine efficiency gained from operation at lower engine temperatures.

As outlined earlier, the cruise speed of any airplane is directly affected by the change in cooling airflow. Opening the cowl doors during cruising flight results in increased cooling airflow and loss of cruise speed; therefore, it may be more economical to accept the increased engine temperatures rather than the losses in airplane cruise speeds.

The augmentor tube engine cooling installation incorporates a muff type heat exchanger which pro-



Call for Cabin Heat

vides heat for passenger comfort and for anti-icing. Maximum utilization of the heat exchanger system is dependent on proper operation of the cowl doors and augmentor vanes. The augmentor vanes are located in the aft end of each augmentor tube and are controlled by cockpit switches from the normal trail position to any position up to 90° from trail.

Normally, the augmentor vanes are inoperable unless the heat anti-icing system is operating; however, since the use of augmentor vanes is desirable during other flight conditions, an arming switch allows operation of the vanes without heat anti-icing system operation.

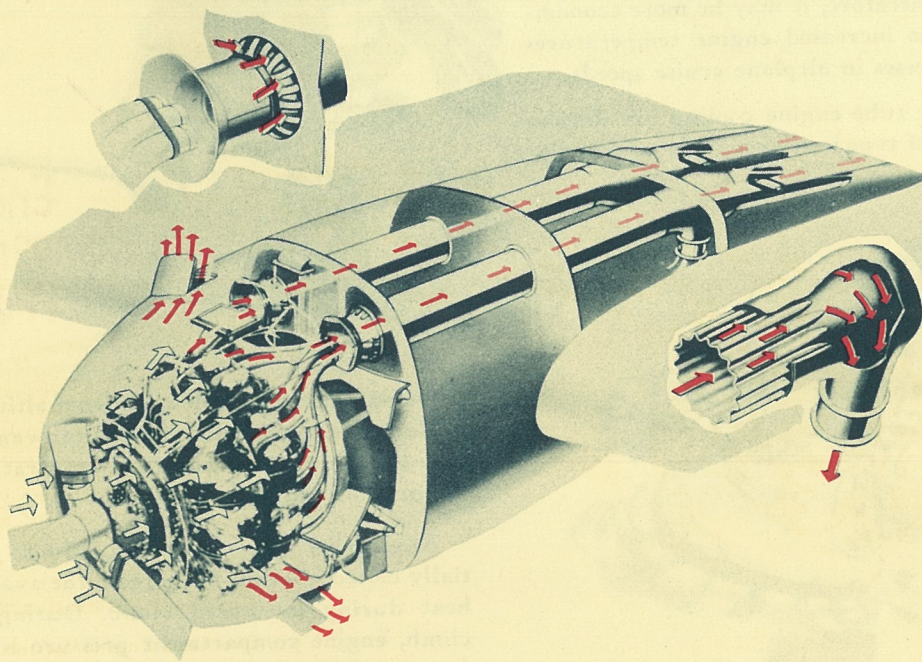


During low-power descent from altitude, it may be desirable to close the augmentor vanes partially to maintain minimum engine temperatures and to aid in cabin heating.

Augmentor vanes may be used also in the partially closed position to increase the available cabin heat during low-speed climb. During low-speed climb, engine compartment pressure is at a minimum, and augmentor muff heating airflow is low. Partially closing the augmentor vanes during low-speed climb, therefore, will increase the exhaust mixing air temperature in the augmentor tubes,

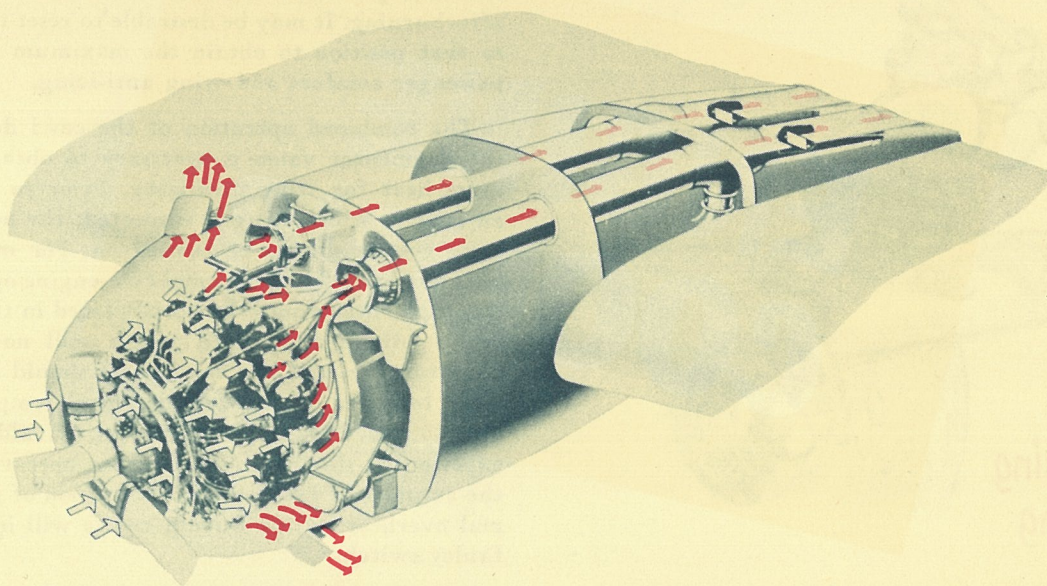
(continued on page 132)

ENGINE COOLING



⇒ Cold Air
→ Heated Air

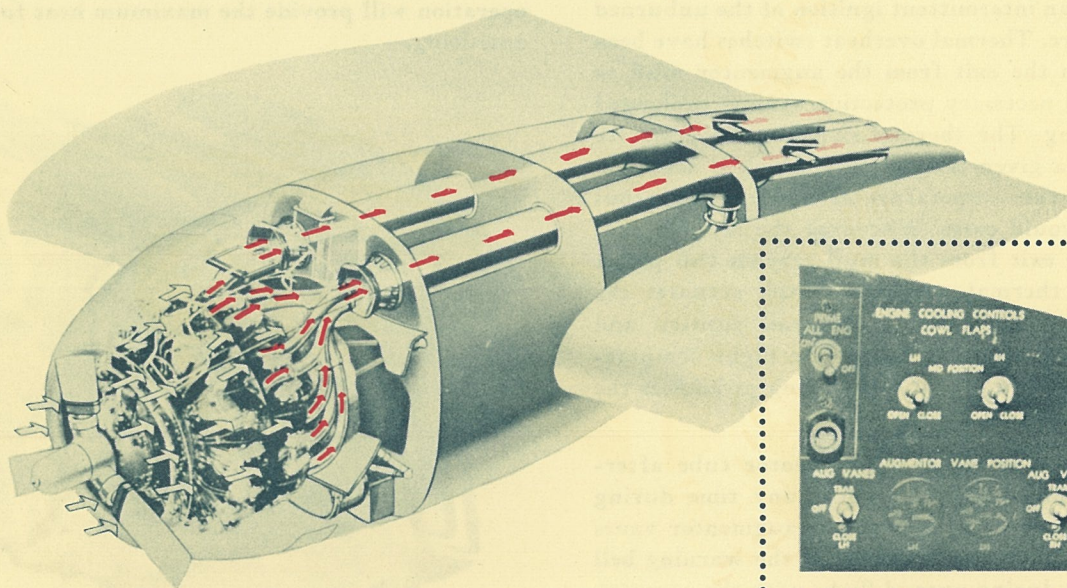
COWL DOORS OPEN
AUGMENTOR VANES IN TRAIL



3

⇨ Cold Air
→ Heated Air

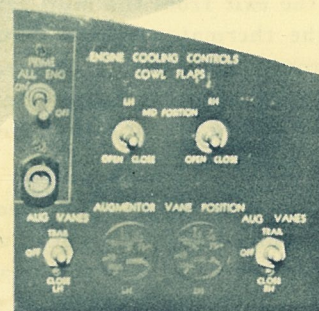
COWL DOORS OPEN
AUGMENTOR VANES CLOSED



2

⇨ Cold Air
→ Heated Air

COWL DOORS CLOSED
AUGMENTOR VANES IN TRAIL



Overhead Engine Switch Panel



Anti-Icing the Wing

since less air is being mixed with the exhaust. Too, it will increase the airflow through the muff, due to increased engine compartment pressure. Increased cabin heat can also be obtained during climb by closing the cowl doors which in turn will increase the engine compartment pressure.

The operation of the augmentor vanes to extreme positions from trail during climb may induce augmentor afterburning. Afterburning in the augmentor tube is an intermittent ignition of the unburned fuel mixture. Thermal overhear switches have been provided in the exit from the augmentor muff to provide the necessary protection against prolonged afterburning. The thermal switches are preset to operate at a given temperature which is considerably below the temperature at which a dangerous situation would exist. Whenever the air temperature in the exit from the muff reaches this preset value, the thermal overhear switch actuates the augmentor vanes toward the trail position and simultaneously rings a bell in the flight compartment. The bell will continue to ring as long as the overhear situation exists.

It is not expected that augmentor tube afterburning will be encountered at any time during normal flight operation with the augmentor vanes in the trail position. Therefore, if the warning bell should ring during normal flight with the augmentor vanes in the trail position, it will probably be a result of a faulty thermal switch.

In most instances, the thermal overhear switch will actuate the augmentor vanes to the trail position. When this occurs, the vanes may be reset to

the lesser position from trail which will not induce afterburning. It may be desirable to reset the vanes to that position to obtain the maximum heat for passenger comfort and wing anti-icing.

The combined operation of the cowl doors and the augmentor vanes is necessary to obtain maximum heat for wing anti-icing. Prior to entering an area in which icing is suspected, the heat anti-icing system should be turned on. For maximum heat available during normal two-engine operation, the augmentor vanes should be placed in the maximum position from trail which will not induce afterburning, and the cowl doors should be regulated to maintain the cylinder head temperatures at 200° to 230°C . Afterburning should not be experienced during normal cruise operation with the augmentor vanes closed. Actuation of the thermal overhear switch during cruise will indicate a faulty switch.

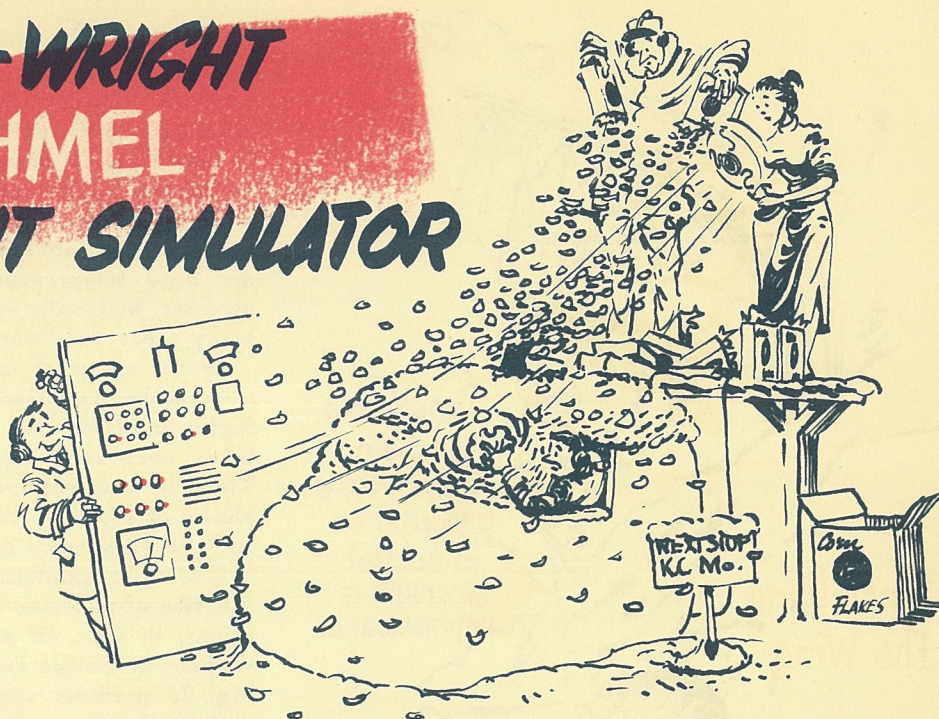
During emergency single-engine operation, the augmentor vanes should be placed in the maximum position without inducing afterburning, and the cowl doors should be regulated to maintain the cylinder head temperatures at a maximum of 230° to 260°C .

The use of the augmentor vanes in a maximum closed position and the cowl doors to maintain maximum cylinder head temperatures at the desired values of 200° to 230°C for two engine operation, and 230° to 260°C for emergency single-engine operation will provide the maximum heat for wing anti-icing.



'Lil Augie, you've
had a busy day.

CURTISS-WRIGHT DEHMEI FLIGHT SIMULATOR



"We've lost oil pressure on No. 1 engine. We'd better head back to the field."

Those are the words of the pilot shortly after an instrument takeoff, as he feathers the left propeller. Clearances are requested and received for immediate emergency landing. The approach is made with ILS. After touchdown, the propeller is reversed and the airplane brought safely to a stop.

Just five minutes before, the oil pressure gage indicated loss of oil pressure on the left engine, and now the airplane is safely on the ground.

But this, in a manner of speaking, was a "false alarm." There was no engine difficulty and no airplane to land. This was a simulated condition . . . one of the incidents on which pilots sharpen their skills in an emergency. And the setting for the alarm was within a Curtiss-Wright flight simulator.

The prompt handling of emergencies actually starts with the design of the aircraft . . . its construction and its detecting and alarm systems. The observance and quick control during emergency conditions are a result of the safety factors built into the airplane, and by the control procedures executed by the pilots.

Quick reactions to incidents are a result of skill. Repeated practice of emergency procedures, such as fires in flight, can be obtained in a flight simulator . . . a Link Trainer with ideas and an electro-mechanical device to execute them.

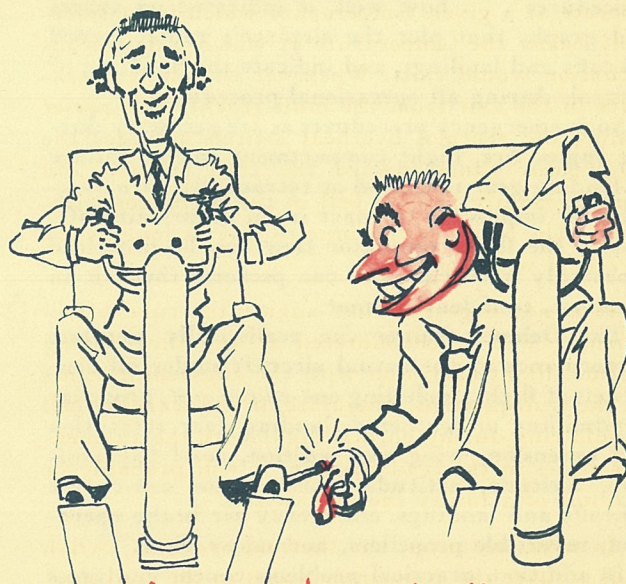
The well-known Link Trainer is substantially a navigational training device, whereas the flight simulators add to these actual flight operations in complete detail to match a specific aircraft. Link, Engineering Research Corporation, and Curtiss-Wright are the three major simulator manufacturers. The Curtiss-Wright trainers are called

"Dehmel" trainers after Dr. R. C. Dehmel who developed them, and the 340 simulator is to be of this type.

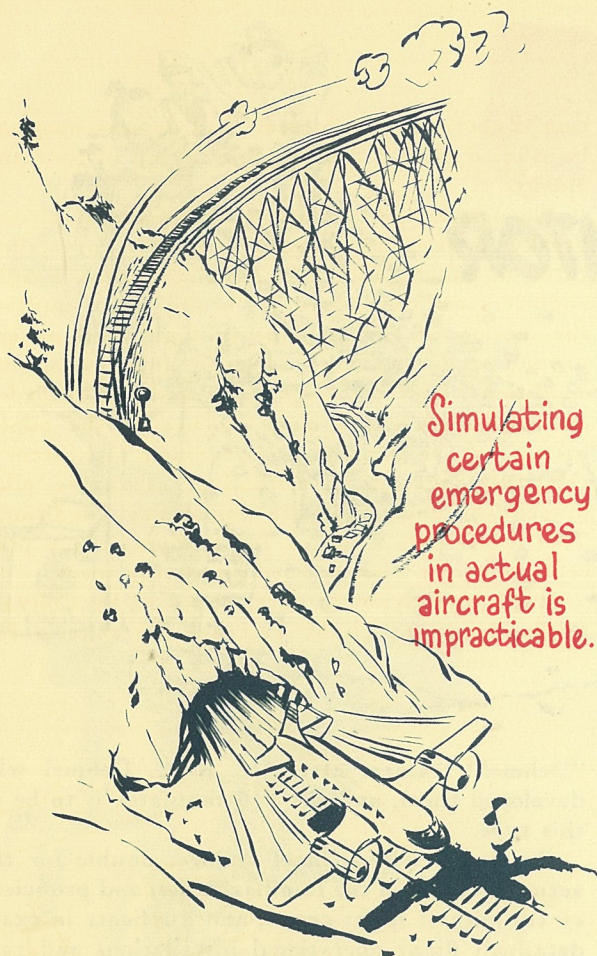
Curtiss-Wright Dehmel trainers double for the actual aircraft in the familiarization and proficiency training of flight crews, and duplicate in exact detail all flight operational installations and performance features, thus saving many hours of actual flying time and aircraft operational expense.

Not only is operation of aircraft for flight training an expensive project, it is sometimes impracticable. In many cases, simulating certain emergency procedures in actual aircraft is next to impossible. As a result, some emergency procedures remain untried for most pilots.

(continued on page 134)



Quick reactions to fires are
a result of skill.



With the Dehmel trainer, flight attitudes and operational conditions are set up at a training console by an observer who "positions control surfaces," and sets up power plant, electrical, hydraulic, and fuel system conditions, which are transposed into instrument readings for action by the pilots. The pilots in the flight simulator control the airplane through all normal and emergency procedures . . . how well, is indicated on charts and graphs that plot the airplane's route, record takeoffs and landings, and indicate the handling of controls during all operational procedures.

Such emergency procedures as are necessary during engine fire, flight compartment smoke, failure of landing gear to extend or retract, etc., are awkward or impossible to enact in an actual aircraft, but in the flight simulator they can be practiced repeatedly until the pilot can perform them in an effortless, confident manner.

The Dehmel trainer can realistically simulate performance of the actual aircraft under all conditions of flight, including one-engine out, propeller windmilling or feathered, landing gear retraction and extension, wing flap position, cowl flap position, altitude, attitude, normal and one-engine takeoffs and landings, emergency air brake operation, reversible propellers, and many more.

In addition, practical problems concerning gross weight, center of gravity, fuel control, wind direc-

tion and velocity, field barometric pressure, and altitude help in the familiarization.

Then, too, there are those simulated emergency or adverse conditions that require action . . . oil and fuel pressure low, carburetor ice, wing icing, reduced BHP, abnormal carburetor air and cylinder head temperatures, too lean or too rich a mixture, hydraulic system failure, tail buffet, and many other conditions and combinations of these.

In the event of incapacity of a crew member . . . another function that can be practiced in the flight simulator . . . the remaining crew member takes over complete control of the "aircraft." Thus, he becomes familiar with and performs all phases of flight operation, and is prepared should such an emergency arise during actual flight.

The flight simulator offers opportunity for coordination of pilot and copilot duties during all operations, so that all procedures can be performed without hesitation and with thorough understanding. It presents complete familiarity with the cockpit for exact sequencing of controls during emergency procedures.

A "flight" in a Dehmel trainer differs from the conventional six-months check flight in that pilots get to practice important maneuvers that cannot be practiced in actual aircraft. In a "Dehmel flight," the pilots are given a flight plan—say, from Denver to Kansas City. They are provided with such information as gross weight and center of gravity location, wind velocity and direction, field barometric pressure, altitude, weather conditions, etc. The airplane may be taking off in a rain- or snow-storm. Whatever the conditions, the flight plan will be executed to its completion regardless of the situations the observer may inject to take it out of the "normal flight" category. The flight



is complete with sound, vibration, operating instruments, radio, and control tower contacts. Any deviation from set procedures is simultaneously indicated and recorded on the training panel.

Airline pilots had a hand in the design of Convair-Liner flight decks. Their recommendations and suggestions resulted in a flight deck designed by pilots for pilots. This cooperation between the design engineer and the airline pilot, and the incorporation of combined ideas is a step toward standardized instrumentation . . . the ultimate in flight decks to eliminate confusion and misconceptions.

The Dehmel trainer is fast replacing expensive trial-and-error methods of developing flight decks in new aircraft. Pilots' reactions to safety devices and warning signals can be studied so as to recognize the need for relocation of instruments and/or controls, and to provide standardized instrumenta-

tion. Experimental problems and devices, too, can be studied with a considerable saving in time and money.

The nose sections, complete with pedestal, circuit breaker panels, instruments, lights, etc., are fabricated in exact detail by Convair. Curtiss-Wright engineers add the electronic "brains" that simulate the motion of the airplane in flight and on the ground under varying climatic and operational conditions. Pilot reactions, measured and recorded on charts, present a clear picture of the pilot's mastery of the airplane, and provide a satisfactory, relatively inexpensive method of analyzing pilot procedures under varying emergency conditions. Too, it presents a means for studying these procedures with a view toward improving them.

Static and dynamic data, supplied by Convair Engineering and Flight Test are the criteria for the "brains."





"NO, IT'S NOT A CONVENTION. THE WORD JUST
GOT AROUND ABOUT THE THR-R-RIFTY
CONVAIR-LINERS!"

Convair **TRAVELER**



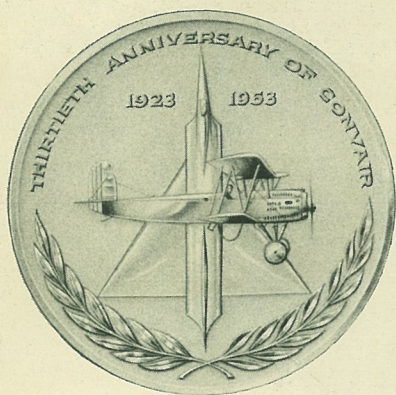
JUNE 1953
VOLUME V
Number 2

Convair TRAVELER

JUNE 1953

VOLUME V

Number 2



Chief Engineer
F. W. Fink

Chief of Service
J. J. Alkazin

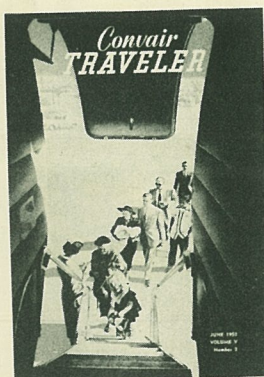
Editor
G. S. Hunter

A digest of Convair-Liner operation and service published monthly by the Service Publications Section of Convair in the interest of Convair-Liner operators and for the promotion of sales and service. Communications should be addressed to Chief of Service, Convair, San Diego 12, Calif.

FOREWORD

Accommodations for the comfort, convenience, and safety of the passengers and crew are contained in this issue. Locations of emergency equipment, and certain circumstances demanding action are discussed since the best protection during any emergency is a knowledge of the equipment at hand and its use.

Included, too, is information on nose wheel steering and some tips for maintenance personnel.



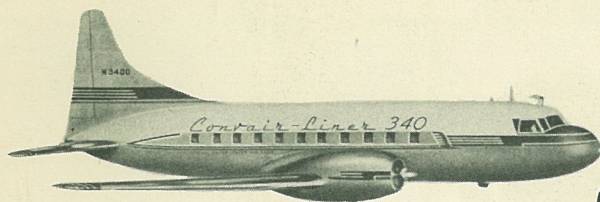
ON THE COVER

They board the Convair . . . the old—the young—the very young . . . some carrying their luggage to save time when they reach their destinations. From the integral passenger loading ramp to the aft compartments, everything is functional efficiency.

The information published in the Convair TRAVELER is to be considered accurate and authoritative as far as Convair approval is concerned. CAA approval, however, is not to be implied unless specifically noted. Airline personnel are therefore advised that use of this material may be restricted by their respective company policies or by CAA publications. Permission is hereby granted to republish any information here presented, but it is suggested that the material be verified with Convair to insure that it conforms with latest changes and developments.

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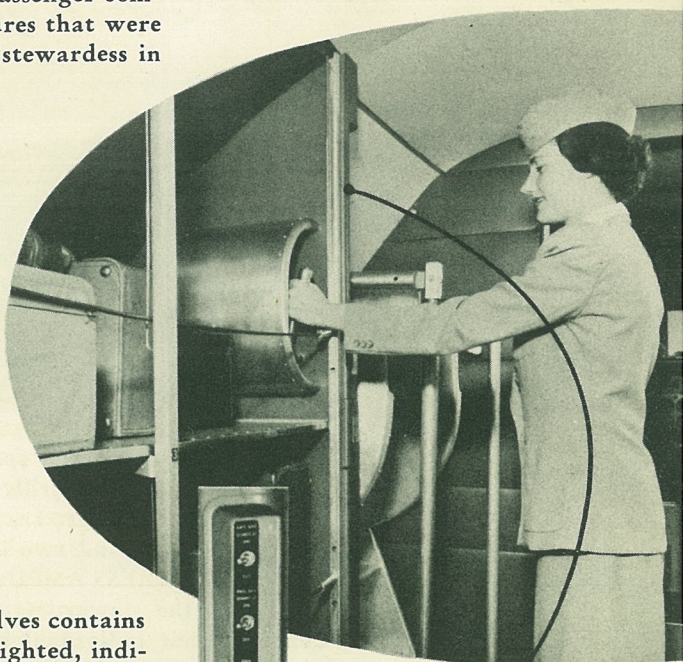


* *Accent on Comfort and Convenience ...*

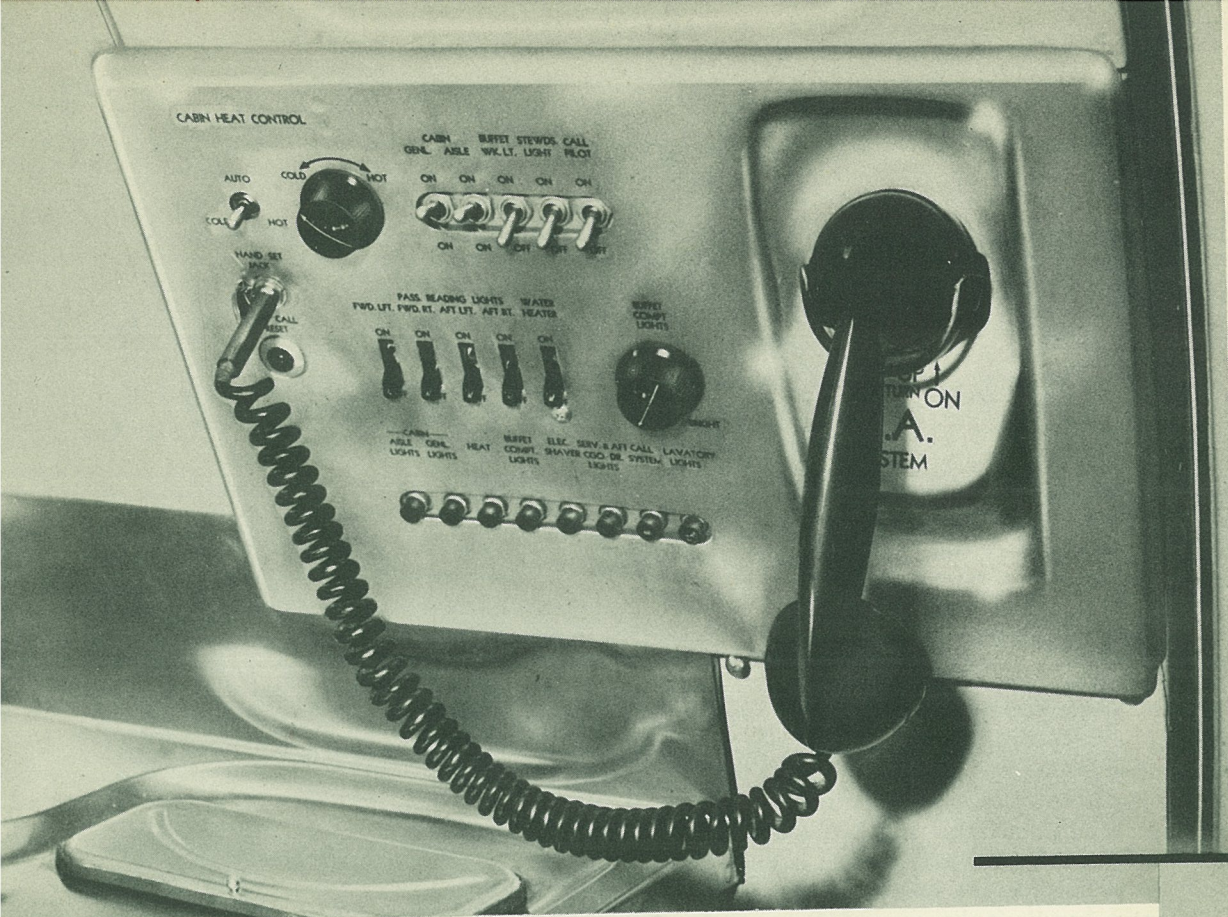
* The Convair-Liner's excellent operating record, plus passenger comfort and satisfaction, are a result of the many design features that were planned for functional efficiency with the passenger and stewardess in mind.

The door and stairway handle and operating lever are located on the aft side of the forward luggage compartment bulkhead, and are protected from luggage by plastic guards. The operating lever is on the inboard edge of the partition and is covered by a hinged panel. When the operating lever is moved up, hydraulic pressure raises the stairway and lowers the door. The latch handle is then moved downward to lock the door and stairway in the closed position. The reverse of this sequence opens the door and lowers the stairway.

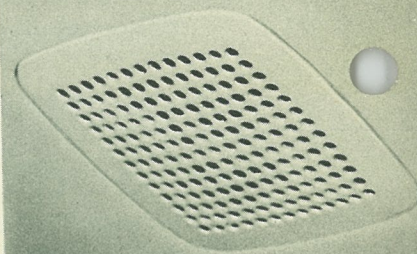
A switch panel at the forward end of the luggage shelves contains a red light, labeled CABIN PRESSURE, which, when lighted, indicates that the cabin is still pressurized and it is unsafe to open the door.



For passenger comfort and convenience several units are located on the underside of the hat rack above each pair of seats. These include a conditioned air outlet; two adjustable fresh air outlets, which permit directing and/or increasing the supply of air, as desired; two non-glare reading lights and switches; and a plastic button to summon the stewardess. When the stewardess call button is pressed it glows and lights a blue light on a panel at the top of the aft passenger compartment door. At the same time, it rings a chime in the buffet. The glow of the passenger call button enables the stewardess to see at a glance which passenger has called. The stewardess, when answering the call, pulls out the button, which extinguishes the light. Also on the door overhead panel are a green light, which is connected to a call button in the lavatory, and an amber light which, when lighted, is an indication to the stewardess that she is being summoned from the pilots' compartment.

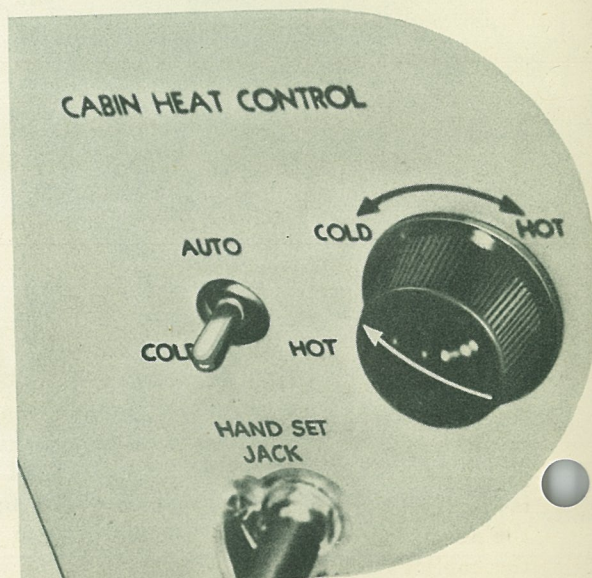


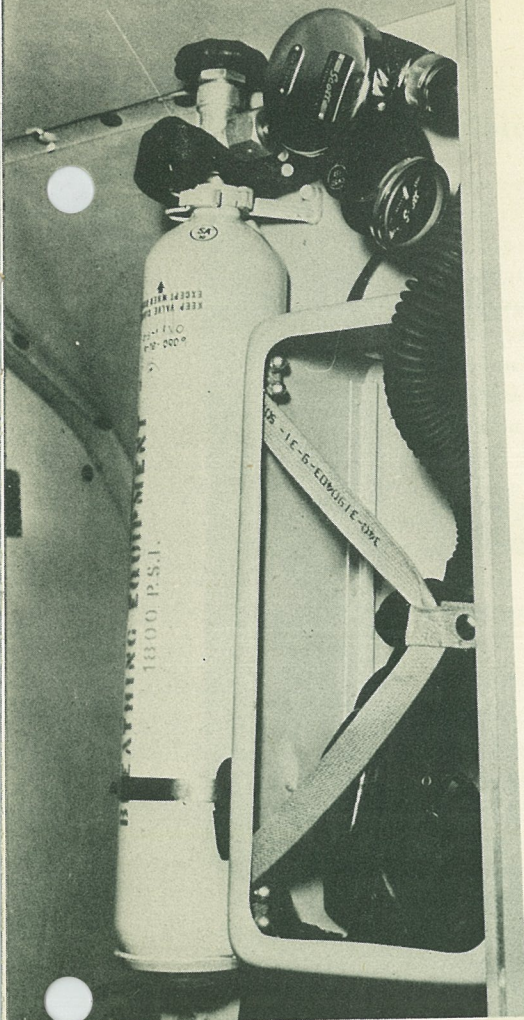
Public address system speakers (installed on some versions) are concealed behind grills mounted on the underside of the hat rack. Twelve speakers are installed in the passenger cabin, one in the lavatory, and two in the flight compartment. When the **PUBLIC ADDRESS AMPL** switch on the pilots' pedestal is turned on, either the stewardess or pilot may address the passengers through their individual handsets. If the stewardess wishes to use the PA system, she contacts the pilot who turns on the PA switch. The stewardess knows when the transfer is completed by the soft hum of the amplifier.



A **stewardess' switch panel** is located outboard of the buffet just aft of the service door. The panel contains a handset for communication with the cockpit and for public address announcements. Included on the panel are switches for controlling temperature, buffet area and passenger cabin lights, and circuit breakers for control of various units in the aft compartments.

The **temperature control rheostat** is labeled **COLD** and **HOT** and, being a sensitive unit, requires careful operation. A point approximately 2:00 o'clock on the dial will usually give a 70-degree cabin. Experience, however, will determine the point on the dial at which this temperature is obtained. Turning the dial to full hot to warm a cold cabin quickly is needless. The cabin will reach 70° just as quickly when the control is set at 70°. Sudden changes in temperature as a result of heating the cabin excessively and then suddenly cooling it, makes passengers uncomfortable. Thermometers are located at the forward and aft ends of the passenger compartment to assist the stewardess in controlling temperature. For those passengers who are too warm in an otherwise comfortable cabin, individual adjustable fresh air outlets are provided on the overhead panel.





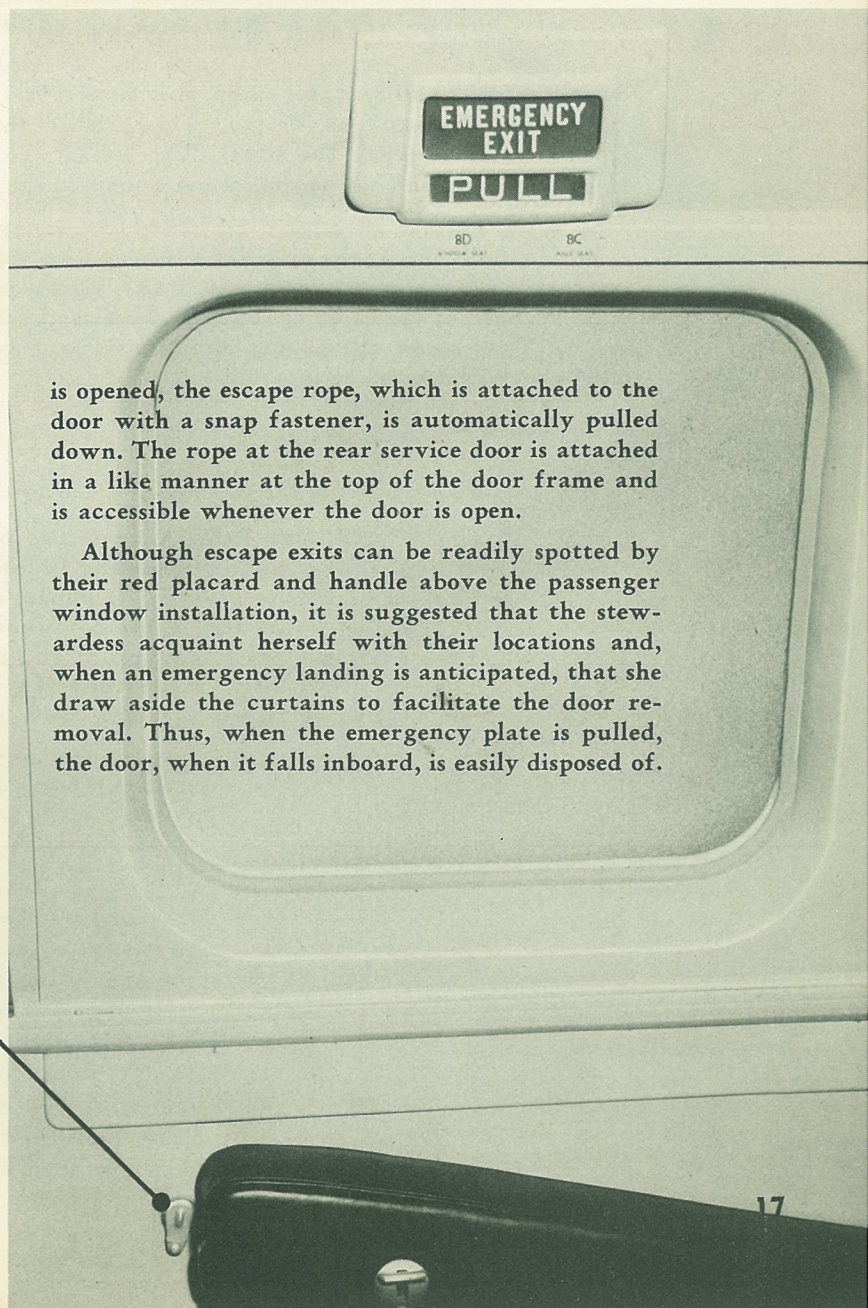
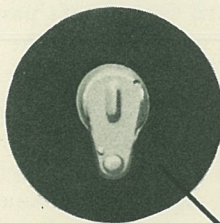
A portable oxygen bottle containing 11 cubic feet of oxygen under 1800 psi pressure is located on the aft face of the electrical equipment rack. This portable unit may be used as necessary by any member of the crew. On some airplanes a smoke mask is attached to the portable bottle and may be used by the observer or other crew members, as required.

In general, two smoke masks are provided, one each for the pilot and copilot. They are full-face masks that provide complete respiratory and eye protection. The masks can be disconnected easily and coupled to the portable oxygen bottle. On most airplanes, these masks are equipped with built-in microphones and hand switches and are connected to the airplane interphone system, thus enabling pilot and copilot to carry on radio-voice communication while wearing masks.

From two to six escape ropes are installed in the airplane, depending upon individual airline requirements. An 18-foot rope is installed at the rear service door and a 16-foot rope at window No. 8, right-hand side of all airplanes. Some airplanes have additional 16-foot ropes installed at window 5, left and right sides, and 10-foot ropes at window 3, left and right sides.

The ropes are installed in fiberglass tubes in the fuselage overhead, following the contour of the belt frames. The ropes are accessible only when the emergency exit doors are open. When the door

Oxygen for the relief of air sickness is available at convenient outlets installed throughout the airplane. A dust cap, installed over the outlet, swings to one side to permit insertion of the mask stem. Insertion immediately starts the flow of oxygen; removal immediately stops it. Before oxygen is available for passengers, it is necessary to notify the pilot so that he may open the shut-off valve on the copilot's console. The valve is normally wired closed to isolate the supply for the use of the crew.



is opened, the escape rope, which is attached to the door with a snap fastener, is automatically pulled down. The rope at the rear service door is attached in a like manner at the top of the door frame and is accessible whenever the door is open.

Although escape exits can be readily spotted by their red placard and handle above the passenger window installation, it is suggested that the stewardess acquaint herself with their locations and, when an emergency landing is anticipated, that she draw aside the curtains to facilitate the door removal. Thus, when the emergency plate is pulled, the door, when it falls inboard, is easily disposed of.

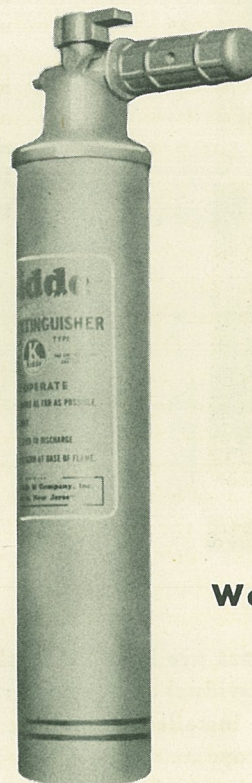
CO₂ Extinguisher

On most airplanes, a CO₂ extinguisher is located in the flight compartment aft of the copilot's seat. On others, it is located at the aft end of the crew locker. The CO₂ extinguisher unit is used to attack small flammable liquid and electrical fires. Carbon Dioxide is a fast non-toxic extinguishing agent that leaves no after-fire residue, and is harmless to materials and equipment. Operation consists merely of swinging up the horn, which is attached by means of a swivel connection, aiming at the base of the fire, and squeezing the pistol grip. It smothers the fire before it gets out of control. Releasing the trigger automatically stops the discharge of gas. The cylinder must be recharged after use.

Water fire extinguishers are located on the forward face of the aft passenger compartment bulkhead on the right-hand side, in the crew locker, and at the top of the luggage racks near the aft end, depending upon individual airline requirements. The water extinguisher is used to put out wood, paper, and cloth fires. It is actually charged with 1 3/8 quarts of an anti-freeze water solution; however, the unit, after discharge, may be refilled in flight with tap water.

To operate the extinguisher, turn the carrying handle as far as possible. This action punctures a cartridge of compressed dioxide gas, which, when the lever is pressed, expels the water. The stream lasts 30 to 45 seconds and has a range of more than 20 feet, which insures reaching the most remote areas.

To fill and recharge the cylinder in flight, unscrew the carrying handle and insert a new CO₂ cartridge with the head of the cartridge at the open end of the handle. Then screw the handle into the valve body until the red lines on the units align.



Water Extinguisher

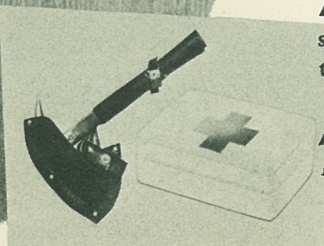
Inertia flashlights are installed on some airplanes for the primary purpose of providing cabin illumination in the event of a landing incident. They are designed to illuminate upon a 3-G impact of the airplane, the shock of which unseats a spring-loaded ball in the bottom of the flashlight case. Whenever the flashlight is illuminated as a result of an impact, it stays illuminated until it is reset, or until the batteries lose their charge. Pulling a pin on the bottom of the flashlight case reseats the ball, which automatically extinguishes the light.

Six flashlight units are installed, one each at the following locations: on forward entrance compartment bulkhead; on aft face of forward passenger compartment bulkhead, left and right; on forward face of aft passenger compartment bulkhead, left and right; and on the forward face of the buffet compartment at the service door.

The flashlights are easily removed from their stowage cases so that they can be used at other times and for other purposes.

A **fire axe** is provided on some airplanes. It is stowed in a sheath on the lower forward face of the forward passenger compartment door.

A **first-aid kit** is located in a cabinet, above the right-hand hat rack, behind the last row of seats.



Nose wheel steering is accomplished with hydraulic pressure supplied from the landing gear DOWN line, thus preventing the wheel from being turned when the landing gear is retracted. A slide type selector valve, mounted on the steering cylinder and operated by a cable follow-up system from the steering wheel, directs fluid to either end of the steering actuating cylinder mounted on the nose landing gear. A centering cam on the oleo strut holds the nose wheel in the straight-ahead position when the strut is extended; thus, the nose wheel is always in the proper position when landing the airplane.

The steering control valve is located on the steering cylinder. The valve is operated through a follow-up cable connection by a steering wheel on the pilot's console. Operation of the steering wheel allows a varying amount of fluid to flow into the right turn line or into the left turn line of the steering cylinder from the selector valve, depending upon the direction and degree of steering wheel turn. As the nose wheel turns, the follow-up cable connection from the steering cylinder automatically returns the control valve to the neutral position, thus maintaining a constant degree of turn (in direct proportion to the amount the steering wheel is turned).

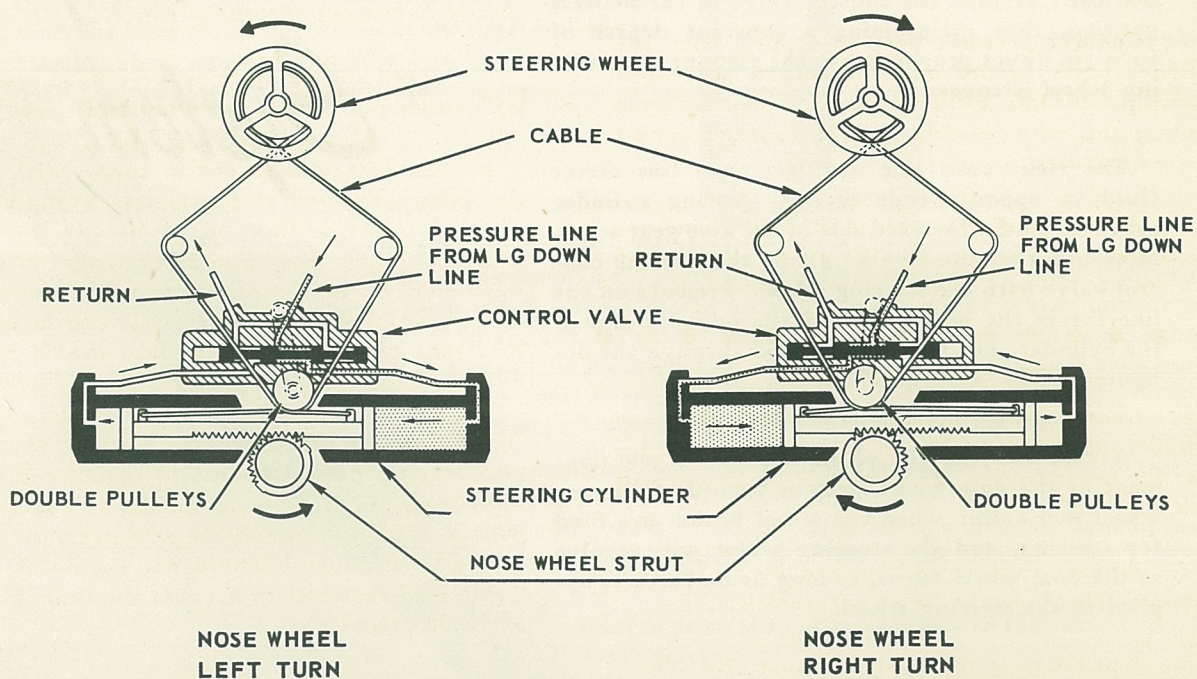
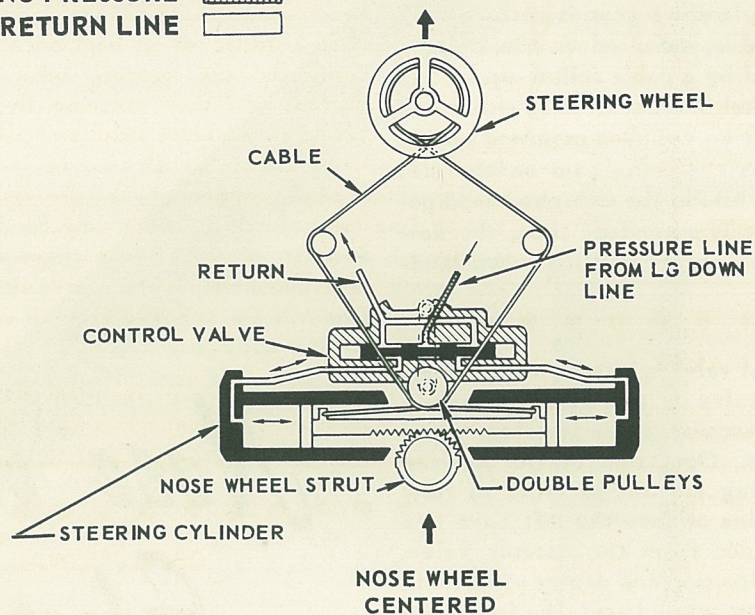
The right turn line and left turn line direct fluid to opposite ends of the steering cylinder mounted on the forward side of the nose gear strut. Metering is obtained by adjusting the steering control valve with the steering wheel. Pressure on one line forces the piston toward the opposite end of the cylinder, and fluid is returned through the opposite line.

A gear rack on the piston engages a gear segment as the nose wheel strut is turned. The nose wheel will caster when the wheel brakes are used for steering, and the steering wheel will revolve as the nose wheel turns, so long as no force is applied to the steering wheel.

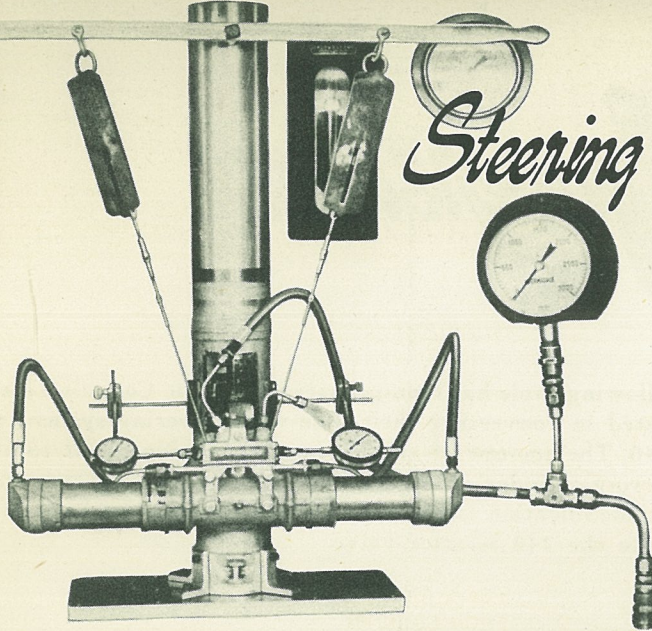
Maximum turn on the nose wheel is $63\frac{1}{2}^\circ$ in either direction, unless the scissors attachment at the strut is disconnected for towing, under which condition the nose wheel is free to rotate 360° .

Nose Wheel Steering System

OPERATING PRESSURE 
 RETURN LINE 



Steering Assembly Test Procedure



CONTROL VALVE

1. Apply 3000 psi at pressure port of selector valve. Maximum combined leakage at Cylinder 1, Cylinder 2, and return ports should be 20 dpm after a one-minute seating period.
2. Connect return port to supply, with cylinder ports capped and valve in neutral. Raise pressure to 1500 psi and hold for two minutes. There should be no external leakage.
3. Connect pressure port to supply, with the cylinder ports capped and the return port open to drain. Actuate pulley system to one extreme position and raise pressure to 4500 psi for a period of two minutes.
4. Actuate pulley system to other extreme position and raise pressure to 4500 psi for a period of two minutes. There should be no external leakage.

STEERING CYLINDER

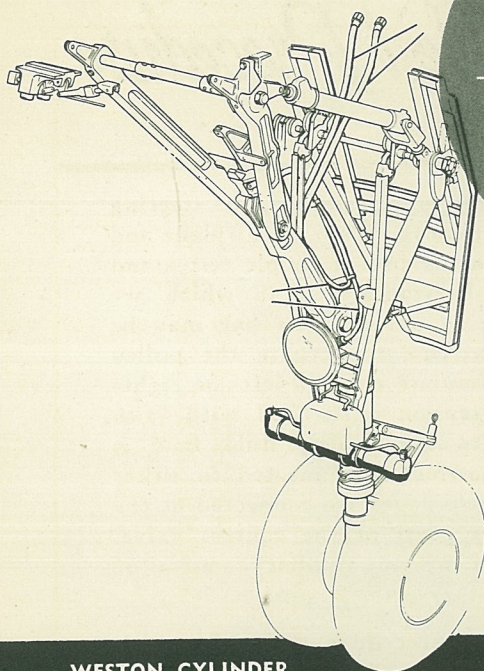
1. Center piston in mid-stroke and plug one cylinder port. Apply 10 psi to opposite cylinder port for two minutes. There should be no external leakage.
2. Release pressure and apply 4500 psi for two minutes. There should be no external leakage.
3. Remove plug and apply pressure of 4500 psi to opposite end for two minutes.
4. Release pressure, and apply 4500 psi to opposite end for two minutes. There should be no external leakage.

When hard steering is experienced, the steering assembly should be removed from the airplane and bench-checked. Convair uses a simple test stand that consists of a horizontal bar to which are connected the steering cables. The bar may be moved to either extreme to actuate the pulley cables in order to simulate either a left- or right-hand turn. Cable tension is checked with "fish scales" connected to the cables; fluid flow is determined by a flowmeter, connected to either cylinder port. Pressure gages are connected at the pressure and return ports of the control valve. Pressure is supplied by an auxiliary source of 4500 psi.

Following is the test procedure used in Convair's hydraulic test laboratory.

OPERATIONAL TEST

1. Cylinder should work smoothly in either direction to 63° from dead center. Selector valve should have even selectivity range.
2. Speed on operation between dead center and 63°, either side of center, should be 10° per second.
3. Connect pressure port to supply with a cylinder port connected to flowmeter. Actuate pulley system to provide flow to the cylinder port. Flow must be .7 gpm minimum at the full ON position with 3000 psi at the pressure port. Shuttle travel from neutral should not exceed .070 inch. Cable load required to actuate the unit should be 30 to 60 lbs.
4. Connect other cylinder port to flowmeter, and actuate pulley system in opposite direction. Flow must be .7 gpm minimum at the full ON position with 3000 psi at the pressure port. Shuttle travel from neutral should not exceed .070 inch. Cable load required to actuate the unit should be 30 to 60 pounds.
5. Mount in special jig and adjust rack to quadrant with eccentric bolts. Match arrow on rack to arrow on quadrant, and adjust tooth clearance so that light is just visible at tooth ends and sides. Connect control valve ports to cylinder ports.



240 340 Conversions

The following table has been prepared for those Convair-Liner 240 operators who are interested in converting their nose wheel steering systems to the type used on the Model 340. The amount of rework involved is dependent to a large extent on the type of steering cylinder now used. The 240 steering selector valve is not convertible, thus, the modification is principally confined to reworking the cylinder so as to accommodate the 240 selector valve.

WESTON CYLINDER

DESCRIPTION

EXTENT OF REWORK



4716

Two Alum alloy forged barrels bolted together at center line.

This cylinder cannot be converted to 340 configuration.



7160

Alum alloy central forging and steel barrels with 2 small dia cable pulleys, each mounted on separate rotation axis.

1. Rework alum alloy housing by milling slot between 2 pulley mounting points. Rework to Weston Dwg #7427.
2. Provide jumper bars, pulleys, spacers, as indicated under 7160-2.
3. Install 340 valve as indicated in item 2 under cylinder #10260.
4. Remove 240 type steering valve and rearrange cables. Install cables, tubing, and steering valve dust covers. Modify cable guards.



7160-2

Similar to 7160 except for incorporation of 2 large dia cable pulleys, both mounted on jumper bars, and utilizing original small dia cable pulley axis.

1. Add parts as indicated in item 2 under cylinder #10260.
2. Remove 240 type steering valve and rearrange cables. Install cables, tubing, and steering valve dust cover. Modify cable guards.



10260

Following improvements are incorporated.

1. Cylinder barrels lengthened so that "O" rings and back-up washers will not pass over gap between cylinder barrel end and end cap.
2. Cautionary nameplate eliminated.
3. Piston head, upon bottoming end cap at either end, will clear bronze rack bar and pulley O.D.
4. Felt wiper and metal scraper added.
5. Cable anchor bolt head now clears bronze rack bar.
6. Index arrows added to facilitate assembly of rack and gear.

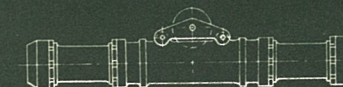
1. Drive 2020-4-4-8 groove pins and rotate cable guards to alternate position, which is provided by means of additional hole drilled in 10164 guard. Use longer cable (was 313-17-180). With these modifications, 10260 cylinder is fundamentally same as 10157.
2. To complete modification, add following parts: 10156 control valve assy (1), 10159 bolt (2), 10163 spacer (4), AN960-616L washer (2), AN960D-10L washer (as req), AN380-2-4 cotter pin (2), 0020-8A nameplate (1).
3. Remove 240 type steering valve and rearrange cables. Install cables, tubing, and steering valve dust cover. Modify cable guards.



10157

Purchased under cylinder and valve assembly #10150. Identical to #10260 except for cable length which is approx 3/4" longer.

340 Configuration—No rework required.



10413

Purchased under cylinder and valve assembly #10410. Identical to #10157 except that packings are modified for Skydrol.

340 Configuration—No rework required.

EMERGENCY AIR OPERATION TEST PROCEDURE

1. Check that pressure in air bottle is 1450-2000 psi. (If air pressure is less than 1450 psi, recharge bottle.)
2. Carefully turn EMERGENCY AIR BRAKE knob ON. When drag on wheels is obtained, air pressure on test gages should not be more than 1000 psi, and should be equal on both gages.
3. Turn emergency air brake knob to HOLD. Pressure on test gages should be the same as that obtained in step 2, above.
4. Return emergency air brake knob to OFF. Brakes should release as air bleeds off.
5. Remove test pressure gages, and install hydraulic bleed units at both upper bleed points on each wheel.

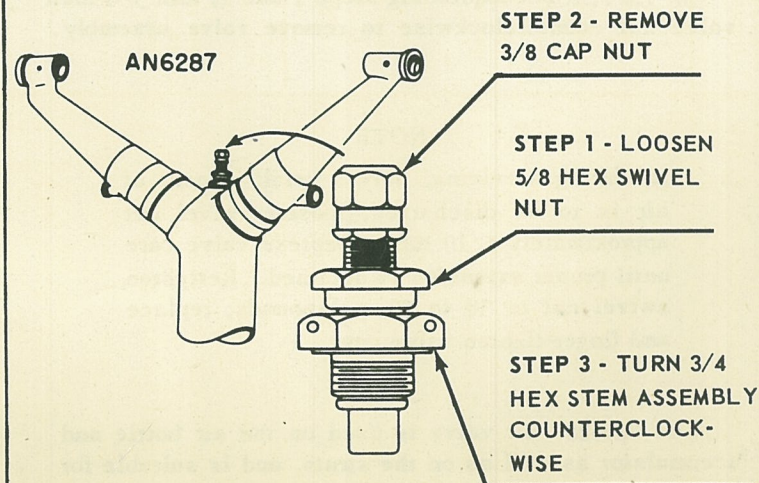
SHUTTLE LOCKOUT TEST

1. Using valves incorporated in bleed units, simulate a break in outboard line. Check that shuttle valve functions and closes off pressure to "broken" line. Pressure can be felt in inboard line, and shuttle lockout action can be heard.
2. Restore operation of shuttle lockout by reactivating "broken" line. Pressure can be felt in both lines.
3. Repeat steps 1 and 2 for inboard line, and then on opposite brake.
4. Bleed lines, and remove test equipment. Check that lines are free of air by operating brakes intermittently to determine firmness.

Know-How

SHOCK STRUT SERVICING

The high pressure air valve assembly (AN6287) on landing gear shock struts can prove to be a dangerous weapon if improperly used. It is important that air be properly bled before removing the 3/4-inch hex stem assembly. If the smaller (5/8-inch) swivel nut is not loosened to open the secondary seal and the air is not allowed to bleed off, the large plug becomes a deadly missile when the strut is charged with air.



Following is the proper method for removing the AN6287 air valve assembly:

1. Loosen 5/8-inch swivel nut in a counterclockwise direction to open the secondary seal. The amount the nut is loosened up to one complete turn will govern the rate of discharge of the air. This step is important whether charging, deflating, or removing the valve assembly, because no air can pass the valve core until the secondary seal has been opened. No advantage will be gained by turning the nut more than one complete turn, and excessive loosening will result in forcing the air screen out of its seat.

2. Remove 3/8-inch hex cap nut, and depress valve stem until all air has been released. Do not accomplish next step until all air is dissipated.

3. AFTER accomplishing steps 1 and 2, turn 3/4-inch valve nut counterclockwise to remove valve assembly.

NOTE

If, during servicing, only a small amount of air is to be discharged, loosen swivel nut approximately 1/10 turn. Depress valve core until proper extension is obtained. Retighten swivel nut to 50 to 70 inch-pounds; replace and finger-tighten valve cap.

The AN6287 air valve is used on the air bottle and accumulator as well as on the struts, and is suitable for all operating pressures up to and including 3000 psi. The same precautionary procedures apply in each installation.

Know-How

MLG BRAKE SYSTEM TEST PROCEDURE

With gear down and locked, install a 2000-psi test pressure gage to one of the upper bleed points on each wheel. Check regular operation of the brakes as follows:

1. Apply full pressure to one brake at a time, and check pressure on test gage for the brake operated. Pressure should be 1400 ± 20 psi. Conduct tests separately on L & R brakes.

2. Operate brakes intermittently and check for feeling of firmness in action. Spongy action denotes air in lines.

3. With brake pressure released, check that brakes release rapidly and have adequate clearance. When airplane is on jacks, adequate clearance is indicated by freeness of wheels. When airplane is resting on ground, adequate clearance is indicated by a .005 minimum tolerance between brake disc and brake block.

4. Place hydraulic system in BYPASS. Check that charged accumulator will operate brakes 4 complete cycles. Return system to PRESSURE.

5. Apply pressure to brake pedals and operate parking brake handle. Pressure on test gages should be 1000-1400 psi.

6. To test operation of check valve on accumulator, place hydraulic system in BYPASS, and note that pressure is dumped on main hydraulic pressure gage while no change takes place on brake hydraulic pressure gage.

7. Operate brakes and note movement of brake pressure gage. Drop should be noted.

8. Return system to PRESSURE.